

# **Exhibit 1**

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

Hermès International and  
Hermès of Paris, Inc.,  
Plaintiffs,

vs.

Mason Rothschild,  
Defendant.

Civil Action No. 22-cv-00384 (JSR)

Expert Report of Scott Duke Kominers, Ph.D.  
August 5, 2022

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1. I am Scott Duke Kominers. I am a Professor of Business Administration in the Entrepreneurial Management Unit at Harvard Business School (HBS), and a Faculty Affiliate of the Harvard Department of Economics, as well as a Research Partner at a16z crypto. I have research and teaching expertise in economics and market design, with, of late, a special focus on non-fungible tokens (NFTs) and other consumer crypto technologies. I also advise a number of marketplace businesses and crypto projects, including several NFT projects, and am an avid collector of NFTs and an active participant in a number of NFT communities. My Harvard address is Rock Center 219, Harvard Business School, Soldiers Field, Boston, Massachusetts, 02138.

## Assignment

2. For this matter, I was asked to define and explain the NFT market and submarkets within that market; and then to explain the position of the Baby Birkin, MetaBirkins, and I Like You, You're Weird NFTs in the market and the submarket(s) applicable to them. I was also asked to explain how NFTs obtain value and—to the extent possible—assess the basis for the value the market put on MetaBirkins, as represented in the tokens' sale prices.

## Summary of Opinions

3. There are two broad submarkets within the NFT market that are particularly relevant to the matter at hand: One submarket comprises “art-only” NFTs, which serve just to convey ownership of (often digital) artworks, imagery, collectibles or similar—without any other utility or direct holder benefits. A second submarket comprises “digital brand” NFTs, which use digital assets such as art, imagery, or collectibles as a springboard for establishing a broader product ecosystem, holder community, and brand. Digital brand NFT projects often launch with an NFT collection built around a specific character (or character series), style, and/or theme that characterizes the brand and then expand on that initial series by adding various forms of utility and additional brand assets. Within the digital brand submarket, there are further categories, according to whether an NFT is creating a novel, NFT-native brand or associated to an already established brand. Fashion brands are one category of established brand that has frequently engaged in NFT project creation.
4. Having reviewed the Baby Birkin and MetaBirkins NFT projects, I found first that Rothschild's Baby Birkin NFT had many of the attributes of an art-only NFT. By contrast, the MetaBirkins NFT project had attributes closely consistent with those of NFT projects in the digital brand submarket—including promises of utility, active community engagement, and certain promotional activities common to digital brand NFTs.
5. In reviewing marketplace data, empirical analysis of the price and trading history of the MetaBirkins tokens suggests these tokens had trading patterns most similar to NFT projects that were either associated to established brands or had significant upfront investment and prior audiences. MetaBirkins does not appear to have had those features except for the use of the “Birkin” handbag name and other Hermès trademarks and brand assets. The association between the MetaBirkin NFTs and Hermès is the most likely explanation for the MetaBirkins' high market prices and trading volume based on my analysis.

## Qualifications

6. I hold an A.B. in Mathematics and an A.M. and Ph.D. in Business Economics from Harvard University. My research specialty is in market design, which uses economic theory and analysis to understand and inform the design and structure of real-world markets. In this context, I have worked on crypto-related market design applications since 2018, and focused particularly on questions of crypto token and incentive design since mid-2021.
7. I have written and published extensively on both the theory and practice of market design in refereed journals, as well as in edited volumes and series, practitioner journals, and opinion journalism venues. I have written numerous academic case studies on market design topics, as well as extensive course and teaching notes on market design entrepreneurship. I regularly give academic and public talks on these topics, both in the context of refereed/juried conferences, and in the context of invited talks and seminars. My academic papers and publications have received thousands of citations to date.
8. Especially over the last year, my research has focused heavily on market design questions associated to crypto and the associated business, protocol, and platform models that have come to be called “web3.” I have published peer-reviewed market design framework articles with crypto applications, as well as an antitrust journal article on the role of crypto in shaping competition. I co-authored the first-ever *Harvard Business Review* article on NFTs, as well as the first Harvard Business School case study on NFTs, and the first Harvard Business School case study on an NFT marketplace,<sup>1</sup> and I have numerous other academic works on NFTs in production. I have also written—at the explicit invitation of the editors—public-facing opinion articles and explainers on NFTs and crypto for venues such as *Bloomberg Opinion* and *Project Syndicate*. I am currently under agreement to co-author a book on NFTs to be published by Penguin’s Portfolio imprint. My crypto articles have not just been used as academic references, but also influenced real-world crypto market design; for example, my co-authored articles in *Future* are frequently cited by crypto entrepreneurs as having informed their reputation token designs. A copy of my current CV is attached as Appendix 3 to this report.
9. At Harvard Business School, I teach an entrepreneurship course called “Making Markets,” which covers crypto, web3, and NFT strategy, among other market design topics. I have also taught in Harvard Business School’s general entrepreneurship sequence, “The Entrepreneurial Manager.” Jointly with several colleagues, I am now developing course materials for a series of new courses squarely focused on crypto topics. I am also part of the founding team of the “Crypto, Fintech, & Web3 Lab” at Harvard Business School, which is part of Harvard’s “Digital, Data, and Design ( $D^3$ ) Institute.”
10. I am frequently called upon to speak on NFTs specifically, and crypto more broadly, in lectures, podcasts, Twitter “Spaces” (akin to live radio shows), and other forums.
11. I also both formally and informally advise numerous marketplace businesses and crypto projects on market design and business strategy. I am an advisor to the Thingdoms and Hungry Wolves NFT projects, as well as Fine Digital, an NFT studio, and koodos, a “web3 Pinterest” centered

<sup>1</sup>These are the first HBS cases on these topics to my knowledge—a search for “NFT” in the internal, logged-in version of Harvard Business School Publishing platform turns up only one other case on NFTs, which was subsequent to mine.

around NFT creation and sharing. In the context of my work at a16z crypto, I advise a number of the firm's portfolio companies on NFT strategy and tokenomics. And I provide regular *ad hoc* advice to students and entrepreneurs on their own crypto ventures, including many NFT projects under development. These advising activities draw upon my extensive experience in market design, and my intensive research and engagement in the crypto space, specifically. Drawing on my broader experience in market design, I also provide market design advice to a number of marketplaces outside the crypto space, including Quora, Lunchclub, NCX, and OneChronos.

12. As I describe in more detail in the “Methodology” section, below, my work requires me to regularly follow the NFT market, as well as the broader crypto market and technology trends. I am also heavily engaged in specific NFT communities, both in the context of my research and recreationally. I have collected hundreds of NFTs, most of which are held at the Ethereum address 0x34202f199ef058302dccc326a0105fe2db53e12.
13. I am being compensated for expert services in this matter at my customary hourly rate for expert work (\$1,500 per hour for consulting services, and \$2,000 per hour for testimony).
14. I worked with a research assistant on this work, Tynan Seltzer, who is one of my former students, and has particular expertise in statistical and computing methods. He was compensated at his customary rate for supporting expert research (\$500 per hour).
15. No part of my compensation or that of my research assistant is dependent upon the outcome of this action or the nature of the opinions that I express. Moreover, I do not hold—and have never held—NFTs from any of the NFT projects at issue in this case (“Baby Birkin”; “MetaBirkins”; or “I Like You, You’re Weird”).
16. I continue to review materials and documents relevant to this case and reserve the right to supplement this expert report based on additional information that becomes available and/or any additional work I may be asked to do.

## Information Considered

17. To understand and characterize the submarket positions of Rothschild's NFT project, we reviewed public social media and publicly accessible Discord messages associated to those projects, as well as Rothschild's own public social media feeds. We read a number of media articles about the projects and/or the present lawsuit, as well. Additionally, we reviewed certain private correspondence pertaining to Rothschild's NFT projects that was shared during discovery. Some of the materials we reviewed had been previously identified and archived by the BakerHostetler team; the other materials were independently identified for consideration by my research assistant and me during our preparation of this report.
18. For the empirical analysis, as described further below and in Appendix 1, we collected and examined token transaction data on 415 NFT projects contemporaneous to the MetaBirkins; all transaction data was collected from the Icy Tools NFT data platform. We also examined the websites, social media feeds, and other public information sources of specific contemporaneous NFT projects identified as relevant by our empirical methods.

19. The report also draws on examples from the broader NFT market, including imagery and social media messaging associated to other NFT projects. These examples were mostly selected for illustration based on my own prior research and experience in the space. Some of the NFTs pictured or described as examples are part of NFT projects I personally have collected NFTs from; this is disclosed in footnotes when it is the case. And finally, the report draws upon my own articles and other articles in the literature on NFTs and crypto, as well as the economics and market design literature, more broadly.

## Methodology

20. For roughly the past 12 months, I have been studying the NFT market and the associated market design applications of NFTs and other consumer crypto technologies. This work builds upon my prior research on crypto marketplace technologies—which mostly focused on incentive design questions around cryptocurrency protocols—as well as my broader research on general frameworks for market and marketplace design.
21. My research on NFTs integrates both qualitative and quantitative methods, following a standard arc used when analyzing new market design contexts, technologies, and applications. The analysis involves analyzing real-world market conditions at both micro and macro levels, combining participant-observation and other ethnographic methods; review of primary and secondary sources; identification and development of case studies; establishing analogies and linkages to classic market design and platform competition frameworks; as well as empirical analysis involving econometrics and other statistical frameworks. All of this work together feeds into development of novel theoretical frameworks and empirical economics research. The work has involved interviews with NFT market participants, entrepreneurs, investors, and other stakeholders; it also draws upon my and my research collaborators’ extensive engagement in the market and specific NFT communities.
22. Outputs include (1) a series of articles synthesizing the market in relation to established market frameworks in venues such as *Harvard Business Review*, *CPI TechREG Chronicle*, *Future*, and *a16z crypto*<sup>2</sup>; (2) business case studies on NFTs and associated academic teaching materials; and (3) both theory and empirical papers in development/preparation for submission to refereed journals.
23. This is the same approach that I used when studying market design opportunities around vaccine production and cross-country vaccine allocation (2020–present)<sup>3</sup>; and market design responses to opportunistic patent litigation (2013-2019)<sup>4</sup>; and that others have used in market design contexts ranging from the allocation of food to food banks,<sup>5</sup> to the design of wireless spectrum

<sup>2</sup>The organization a16z crypto maintains a self-titled practitioner publication.

<sup>3</sup>Juan Camilo Castillo et al., “Market design to accelerate COVID-19 vaccine supply”, *Science* vol. 371, no. 6534, doi:10.1126/science.abg0889. <https://www.science.org/doi/pdf/10.1126/science.abg0889>, 2021: pp. 1107–1109.

<sup>4</sup>Lauren Cohen et al., “Patent Trolls: Evidence from Targeted Firms”, *Management Science* vol. 65, no. 12, 2019: pp. 5461–5486.

<sup>5</sup>Canice Prendergast, “How Food Banks Use Markets to Feed the Poor”, *Journal of Economic Perspectives* vol. 31, no. 4, 2017: pp. 145–162.

auctions.<sup>6</sup>

24. In this report, I draw upon my existing research work on NFTs to provide background regarding the technology and of NFTs, the structure and behavior of the NFT market, and some distinct business models that have emerged around NFTs. I then examine how the MetaBirkins project fits within that context and the surrounding market conditions, drawing on the various qualitative frameworks described above. Additionally, I conduct quantitative empirical analysis to attempt to characterize how the market treated the MetaBirkins project, relative to other NFT collections launched in close temporal proximity.

## Non-Fungible Tokens (NFTs): Basic Definitions and Concepts

25. NFTs are digital records of ownership, typically recorded on a public ledger called a blockchain. NFTs are non-fungible in the sense that each one is individually unique, unlike, say, dollar bills or cryptocurrency, where all units are functionally equivalent. Blockchain technology means that it is possible to publicly verify the virtual address, commonly known as a “wallet,” that owns a given NFT, as well as to securely transfer that NFT to another holder, or exchange it for some form of on-chain consideration (often cryptocurrency, or another NFT).
26. Like in the way that physical deeds serve as ownership records for land or other physical property, NFTs are often used as a form of “digital deed” representing ownership in digital or physical assets. Those assets can be associated with the NFT by convention (i.e., public agreement), by contract, or by explicit reference recorded in the underlying blockchain ledger.
  - (a) NFTs are created—or “minted”—by executing a software program to instantiate the tokens. At that time, and/or potentially later, the creator can define the assets and other property rights associated to the NFT. The creator typically has full control over the rules and function of the program that manages the NFT; once determined, however, these rules and functions typically cannot be changed.
  - (b) Creators and other holders of NFTs can keep their NFTs, gift them to others, or sell them. Following an NFT sale, the ownership rights embedded in the NFT transfer to the buyer.
  - (c) Primary-market NFT sales (“mints”) often intentionally set the sale price below what the creator expects will be the market-clearing price. Because in such circumstances demand can heavily outstrip supply, creators often give the privilege of minting to a pre-selected set of people, known as a “whitelist” (or “allowlist”). Whitelist membership can be granted for a variety of reasons—for example, the creator might give membership to their personal friends; to people who have invested in or otherwise supported the project; or to people who engaged in activities related to the project in advance of its release.
  - (d) Secondary-market NFT transactions are mediated by a variety of publicly accessible marketplace platforms such as OpenSea, LooksRare, and Rarible. Additionally, some NFTs trade on private or collection-specific marketplaces, as well. All these platforms typically provide information about the NFT, including some degree of metadata explaining the

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<sup>6</sup>Alexander Teytelboym et al., “Discovering auctions: Contributions of Paul Milgrom and Robert Wilson”, *Scandinavian Journal of Economics* vol. 123, no. 3, 2021: pp. 709–750.



- NFT's features and associated property rights. They also provide interfaces that prospective buyers and sellers can use to engage in NFT transactions—such as buying and selling, and also often issuing of offers to purchase.
- (e) Most NFT transactions are settled and recorded on the blockchain effectively immediately, possibly with the platform managing royalties/transaction fees and other terms of exchange. In many cases, both the platform and the original creator receive a percentage transaction fee on each sale.
27. Because NFTs are digitally native records rooted in software, they can easily be given functionality beyond simply recording ownership. For example, NFTs often grant holders admission to private chat channels where they can engage with each other; private websites with special merchandise access; or exclusive events. These benefits are conferred by way of “token-gating”—configuring software to allow access only to those users who can demonstrate that they hold the relevant NFTs in their crypto wallets. NFTs can also be programmed to expand or evolve in various ways over time, and can be embedded in environments such as online games and metaverse platforms. And NFT creators can give additional assets to holders—including additional NFTs—through a form of direct delivery called an “airdrop,” which is loosely analogous to email, in the sense that the new assets are sent directly to holders’ addresses on the blockchain.<sup>7</sup> Standalone features of NFTs beyond just ownership are referred to as “utility”—representing direct use value to holding the NFT.
- (a) As Steve Kaczynski and I explained in our *Harvard Business Review* article “How NFTs Create Value,” “NFTs can function like membership cards or tickets, providing access to events, exclusive merchandise, and special discounts—as well as serving as digital keys to online spaces where holders can engage with each other. Moreover, because the blockchain is public, it’s even possible to send additional products directly to anyone who owns a given token. All of this gives NFT holders value over and above simple ownership[...].”<sup>8</sup>
- (b) As we continued in the article and I discuss further below, utility “provides creators with a vector to build a highly engaged community around their brands.”<sup>9</sup> Creators use direct utility to drive attention to their NFT projects and incentivize people to collect them early on. From there, they often leverage their “community” of holders and other enthusiasts to drive further value to the NFTs and potentially serve as brand evangelists.
28. Importantly, the number of NFTs in a given collection is often limited so as to create a form of scarcity. The original Bored Ape Yacht Club for example, comprises 10,000 NFTs of cartoon ape images, and the associated software guarantees that no more can ever be created.

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<sup>7</sup>Technically, some airdrops are implemented in the fashion described here, whereas others require the token holder to take an action in order to claim the airdropped asset(s). For simplicity, I use the term “airdrop” interchangeably for both of these contexts, which is consistent with the way the term is used in the market.

<sup>8</sup>Steve Kaczynski and Scott Duke Kominers, “How NFTs Create Value”, *Harvard Business Review*, 2022.

<sup>9</sup>Kaczynski and Kominers.



Figure 1: An example Bored Ape Yacht Club NFT, #6945.

## Identification and Characterization of NFT Submarkets

29. To identify and characterize submarkets within the NFT market, I first examine various mechanisms by which NFTs attain value, and how those sources of value relate to market demand. Those value and demand drivers then inform creators' heterogeneous strategies in developing their NFT projects, leading naturally to heterogeneous market segments.
30. The analysis points to two broad submarkets within the NFT market that are particularly relevant to the matter at hand: "art-only" NFTs, which serve just to convey ownership of (often digital) artworks, imagery, collectibles or similar; and "digital brand" NFTs, which use digital assets such as art, imagery, or collectibles as a springboard for establishing a broader product ecosystem, holder community, and brand. Within the digital brand submarket, there are further categories, according to whether an NFT is creating a novel, NFT-native brand or associated to an already established brand. We examine established brands' NFT opportunities in detail, and note that fashion brands, in particular, have leveraged these opportunities in creating a variety of NFT projects.

### (Some) Sources of Value and Market Demand for NFTs

31. My ethnographic and case study research in the NFT space, as well as my work with NFT-focused companies and investors, points to a number of different reasons why people choose to acquire and hold NFTs. NFT market participants describe these rationales explicitly both in conversation and in public postings; moreover, in talking with NFT entrepreneurs, these various rationales frequently come up in discussions around user and collector incentives.
  - (a) Some people collect and hold NFT assets specifically because of the associated ownership rights—for example, one might buy an art NFT because they like and want to own the associated work, just as one might buy a physical artwork. Similarly, one might buy an NFT artwork for the sake of supporting the artist. "Conspicuous consumption" in this

context is common—many NFT holders share their recent and past purchases publicly over social media or other channels. As with other art objects, this can be a signifier of taste, as well as a signifier of wealth (especially given many NFTs’ high prices).

- (b) Others buy NFTs for the sake of the direct utility value—for example, fans of The Hundreds, a streetwear brand, might choose to acquire the brand’s Adam Bomb Squad NFT because it confers early access to new product releases, as well as the opportunity to attend events hosted by the brand’s founder.<sup>10</sup>
- (c) Still others acquire NFTs primarily to access and be part of the community of holders—the Bored Ape Yacht Club NFT collection, for example, counts major celebrities such as Jimmy Fallon, Madonna, and Stephen Curry among its holders,<sup>11</sup> as well as a number of major businesspeople worldwide. As mentioned previously, these communities make communications channels available for members, and may also hold physical events exclusive to their NFT holders. The Bored Ape Yacht Club, for example, holds a yearly “ApeFest” event for holders of its NFTs.<sup>12</sup> Additionally (or alternatively), for some, affiliation in an NFT community contributes to a sense of personal identity—people often adopt favorite NFTs as their profile pictures on social media platforms or post physical reproductions on their walls.
- (d) And finally, building off all of the preceding categories, traders and speculators may buy a given NFT with the express goal of reselling them at a profit later, once more people become interested in owning the NFT for the types of reasons described above, and the resulting demand increases drive up the market price of the NFT.<sup>13</sup> These types of collectors are further segmented as follows:
  - Short-term traders (“flippers”) aim to collect NFTs and hold them for short periods of time and resell them for a consistent but relatively small profit soon after purchase. These traders often are especially active in seeking access to NFTs at or around the “mint” stage, in hopes of taking advantage of “hype”-driven trading activity in the collection. In particular, they work hard to gain access to whitelists, so that they can acquire NFTs at below expected market-clearing price and then resell them soon afterwards as the market finds the clearing price.
  - Long-term traders, by contrast, undertake an investment strategy more like that of a value investor in equities markets—they form an evaluation of the long-run prospects of a given NFT, and buy with an eye towards creating a portfolio they hope will increase in value over time.
- (e) Of course, the list here is not exhaustive, and the various reasons for collecting NFTs I have described are nonexclusive—many NFT holders enjoy the direct ownership and utility benefits, as well as participating in the community of holders, but at the same time think of their NFTs as investment assets they might later sell if the market value goes up sufficiently. As Kaczynski and I described: “owning an NFT effectively makes you an investor, a member of a club, a brand shareholder, and a participant in a loyalty program all at once.”

<sup>10</sup>Disclosure: I hold Adam Bomb Squad NFTs.

<sup>11</sup><https://decrypt.co/86135/biggest-celebrity-nft-owners-bored-ape-yacht-club>

<sup>12</sup><https://twitter.com/boredapeyc/status/1526359246476132352>

<sup>13</sup>Sebeom Oh et al., “Investor experience matters: Evidence from generative art collections on the blockchain”, *Working Paper*, 2022.

- (f) Some collectors hold NFTs specifically because they expect them to evolve over time in ways that increase the utility and/or investment value. And meanwhile, one might make some short-term NFT trades, while also holding other NFTs for longer periods of time. Like with equity investments, for example, if the price of the given NFT goes up soon after purchase, it is not uncommon for people to sell it as part of a de-risking strategy, even if they continue holding other NFTs in the same collection.
32. Just as in any other market, the economic dynamics of the NFT market are shaped by the sources of individual demand for owning NFTs. An NFT's ownership, utility, community, and investment value together drive market demand; like with any asset, demand and supply together determine the NFT's market value. This means that NFTs may attain high prices because of demand based on fundamental features manifested in ownership or utility; or because participating in the associated community is perceived to be of high-value; or because investors perceive future value; or for a mixture of these reasons.
33. In the NFT market, I have observed that these different aspects of NFT value frequently build upon and reinforce each other. For example, a high-quality community dynamic might be a source of increasing demand as it becomes better known; as a result, investors often seek out NFTs with high-quality communities in hopes of later reselling them at higher prices as more people become interested in joining the community. Similarly, perceptions or promises of valuable future utility might drive demand for an NFT as a short- or medium-term investment asset.
34. A consequence of this logic is that, especially early on, NFTs thrive on public attention and recognizable features that are likely to drive long-run future sales. A key feedback loop here is that perception of likely future value can raise the perceived investment value, driving increased transaction volume, and leading to royalty revenue that might help the project build future utility, as well as attention that may increase community demand.
- (a) Note that in this case, when everything works out well, a market perception that an NFT will succeed can become something of a self-fulfilling prophecy: early trading volume and purchases can generate revenue and community engagement that eventually contribute to future value, justifying the early investment. This dynamic is not unique to NFTs—it happens with many other types of startup companies, in which early attention and product traction drives investment and user engagement, which enables the founders to develop the product further. Such dynamics are particularly important in startups with network effects in which early participation grows the value for future users.
- (b) However, just like with startup companies, the majority of NFT projects fail to deliver on early potential. Sometimes this is a result of intentional malfeasance—the creators may not have intended to build out an ecosystem around their NFTs in the first place, and simply misled their customers. Often, however—again, as with other startups—the issue is with execution, or running out of resources before the product vision can be fully realized.
- (c) Having more initial attention and traction—and especially, more initial revenue from primary sales and secondary sales royalties—gives NFT creators more of a “runway” to build out their communities and utility. Moreover, as Jad Esber and I explained in *Harvard Business Review* and Christian Catalini and I explained in *CPI TechREG Chronicle*, NFTs and

other web3 projects benefit from the powerful form of network effect built around community cohesion<sup>14</sup>; as a result, they are especially reliant on early engagement and traction. Thus, all else equal, NFT creators are strongly incentivized to undertake activities that drive market perception that their NFTs have significant value, both now and in the future. Again, this maps to a standard dynamic of startup entrepreneurship.

### **(Some) Ways in Which NFT Creators Build Value and Market Demand for their NFTs**

35. Creators can engage in a variety of different activities to drive real and perceived value to their NFTs. My market observation, ethnography, and case study analysis has found that many of these activities map onto the sources of NFT value described earlier:
  - (a) Creators can enhance the ownership value associated to their NFTs, for example by granting holders intellectual property rights over the NFT assets they own. The Bored Ape Yacht Club NFT holders, for example, are granted full commercial licensing rights to the ape images represented in their NFTs. Holders have built businesses around these images—everything from a media collective to a fast food restaurant<sup>15</sup>—and holders also license their Apes for use in other contexts, such as commercial products and creative works. Indeed, there are companies that have been founded to assist in licensing NFTs for commercial use.<sup>16</sup>
  - (b) Creators can also introduce new forms of utility to their NFTs that expand the ecosystem in additive ways: They might, for example, introduce novel NFT assets that build upon the original collection (such as a companion or “pet” NFT for each primary NFT); add a fungible token that can be used as a currency inside of their NFT product ecosystem; or offer custom holders’-only merchandise. Crucially, creators can introduce new forms of utility in both digital and physical spaces. One-off utility (such as airdrops, or events only open to holders) tends to drive short-run demand leading up to the utility instance, whereas ongoing utility (such as access to private chat channels) drives longer-term value. For example, The Bored Ape Yacht Club NFT project saw significant price appreciation leading to the release of a secondary collection featuring “Mutant Apes.”
  - (c) Creators can foster community cohesion by engaging the community themselves, and by organizing events or other opportunities for community members to interact with each other. Many NFT projects employ part- or full-time community moderators and/or managers this purpose.
  - (d) Creators can raise the perceived investment value of their NFTs by creating (or at least promising) forms of value of the types already described. The pathway of effect here is that adding value to the NFT raises the demand for it, which raises price (assuming constrained supply); thus, if an investor foresees future value for the NFT, then they may have an incentive to acquire it now.

<sup>14</sup>Jad Esber and Scott Duke Kominers, “Why Build in Web3”, *Harvard Business Review*, 2022; Christian Catalini and Scott Duke Kominers, “Can WEB3 Bring Back Competition to Digital Platforms?”, *CPI TechREG Chronicle*, 2022.

<sup>15</sup>Nelson, Jason. Bored ape yacht club-themed burger joint debuts in California. *Decrypt*, Apr. 2022. [decrypt.co/97474/bored-ape-yacht-club-themed-burger-joint-debuts-in-california](https://decrypt.co/97474/bored-ape-yacht-club-themed-burger-joint-debuts-in-california).

<sup>16</sup>Quiroz-Gutierrez, Marco. Hundreds of bored ape owners look to tap their nfts for cash through brand deals. *Fortune*, July 2022. [fortune.com/2022/07/01/bored-ape-yacht-club-nfts-intellectual-property-rights-boredjobs/](https://fortune.com/2022/07/01/bored-ape-yacht-club-nfts-intellectual-property-rights-boredjobs/).



- (e) Note that demonstrated value—that is, value that has already been built within the NFT ecosystem and established in the market—is clearer/less uncertain from a buyer perspective. It is significantly easier for a buyer to estimate the value of holding an NFT that is certain to grant access to an already-scheduled event than it is to estimate the value, say, of holding an NFT whose creator might theoretically organize events in the future.
  - (f) Nevertheless, in the NFT space, it is common for creators to signal or hint at sources of value that have not yet been fully realized, just as technology product entrepreneurs might hint at new or forthcoming features.
  - (g) To this end, creators sometimes recruit “influencers” from either inside or outside the NFT space to help promote NFT projects. Influencers typically have wide followings, expanding the NFT project’s potential audience; moreover, because of influencers’ apparent public reputations, their endorsements may help give an NFT project some form of “social proof” of quality to prospective purchasers. While influencers sometimes promote projects simply because they are interested in them, in many cases they are compensated for that promotion, either through direct payment or preferential access to the NFT collection.
36. Creators often maintain public social media accounts both for themselves and for their NFT projects, as well as Discord channels or other communication platforms where current holders of their NFTs can interact with each other, as well as the broader community built around them.
- (a) These messaging channels serve both to provide information about the NFT project (such as updates on features and opportunities for holders) and to create and surface opportunities for community engagement.
  - (b) Oftentimes, the goal is to make ownership of the NFT rewarding for holders, and aspirational for non-holders. NFT communities form real camaraderie, and participate in various entertainment activities such as movie nights or poker games.<sup>17</sup> Additionally, the social media activity, in particular, provides an opportunity for conspicuous consumption and community bonding—people can see who owns a given NFT, and who engages with them.
  - (c) One category of activity that often sees particular reward on NFT social media is the entry of a new member of the community, or the purchase of a particularly high quality NFT by an existing member of the community. In such circumstances, the purchaser will typically post the NFT image or link, and other community members will respond with compliments or other cheering. This serves as a sign of community affection for purchaser, as well as a form of affirmation for the decision to purchase. Additionally, the activity becomes a sort of advertisement—the strong community sentiment visible on social media can cause others to notice the NFT project and potentially become interested in joining, as well. Figure 2, for example, shows how the SupDucks community reacted when I formally joined the community by acquiring a SupDuck NFT: for hours, members of the community interacted with me by commenting on my post with the brand’s official

<sup>17</sup>See, e.g., <https://discord.com/channels/870100811659751484/870504403235377193/970046829658005544> and <https://discord.com/channels/905784075716005939/961729938485022752/999840406122537000> for movie and poker events respectively associated to the Chain Runners and Paradise Trippies NFT projects. *Disclosure: I hold NFTs from both projects.*

greeting, “Sup” (to which I responded “Sup,” as is customary); this both contributed to my own sense of membership in a broad community and drove social media attention through the large number of “Sup” tweets.<sup>18</sup>



Figure 2: Comments on my Twitter feed after I posted about joining the SupDuck community.

- (d) Creators also sometimes use their various public and social media channels to engage in forms of direct promotion and/or advertising for their NFT projects. In this context, creators might make a direct case for why someone should buy their NFT, or, for example, announce novel features or partnerships. Some creators also explicitly draw attention to

<sup>18</sup>Disclosure: As the discussion here implies, I hold SupDucks NFTs (and other NFTs from their digital brand ecosystem).

their NFTs' prices, highlighting high prices as a sign of strong market demand, with an implication that market demand signals value that should lead one to buy. For example, Figure 3 shows the “Noodles” NFT collection retweeting a post declaring their project to have a “thin floor,” meaning there are not many tokens listed at the floor price, so that buying them would quickly raise that floor price.



Figure 3: Noodles retweeting a post on Twitter explaining that with only a few sales, their floor price could double.

37. Because some parts of the NFT market are overall quite liquid from both human and algorithmic NFT traders, even vague or abstract hints of current or future value can affect market demand. Like in any market characterized by scarcity of a given good, then, demand to hold the NFT as an investment can push up the market price. This can drive further attention, which can lead to additional demand, and thus raise the price further. As a result, some NFTs have extremely fast “hype cycles” in which a sharp spike in demand—and concomitantly, a spike in price—is kicked off by a small amount of initial activity or information.

(a) Flippers, in particular, are looking for indications that a project may see demand increase in the immediate near-term. As a result, they sometimes anchor on small amounts of price movement, or public signals such as news articles that may drive interest from new



candidate purchasers. (This is a version of a “public information” herding effect we often see in other markets.)

- (b) Creators sometimes encourage this sort of behavior by both amplifying the hype and by highlighting recent transactions and transaction volume, or by recruiting influencers to highlight this information.

## Key Submarkets

- 38. Direct observation of the market indicates that NFT projects to some degree differentiate themselves according to the type of holder audience they are targeting, resulting in submarkets. There is some degree of overlap or transition between submarkets, but at a high level the various NFT project categories are often associated with distinct development paths and marketing strategies.
- 39. One of the earliest and largest current use cases of NFTs is for establishing property rights over digital art and collectibles. Examples include everything from digitally native fine art works to digital trading cards and even metaverse architecture. Figure 4 depicts a few examples.<sup>19</sup>

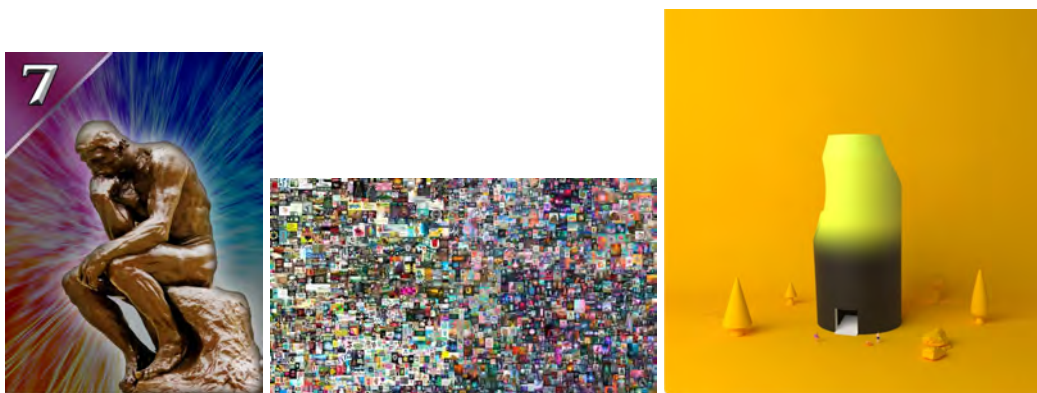


Figure 4: Left: A “Curio Card” NFT. Middle: “Everyday, The First 5000 Days” by Beeple. Right: An architectural design from SOLIDS NFT.

- (a) Using NFTs to establish property rights over digital assets is a particularly natural use case because historically for these goods it was often difficult to establish clear property rights without the help of a trusted intermediary like a gallery that can confirm and guaranteed transfer of ownership. (Note that this trust role can also sometimes be played by a technology platform—for example, in many video games, the game platform itself processes the trading of items among users, and users trust that the platform will not duplicate items or otherwise distort the transaction process.)
- (b) NFTs and public blockchains make it in principle possible for anyone with access to the technology to create digital works for which ownership can be easily tracked and exchanged.

<sup>19</sup>Disclosure: I hold SOLIDS NFTs, and advise the company that developed them, FINE Digital.

**Art-Only NFTs**

40. Within the category of NFTs establishing ownership rights over digital assets, some NFTs are “art-only” (or “music-only,” or similar); NFTs in this submarket convey ownership in artworks, imagery, or art- or imagery-based collectibles, without any other utility or direct holder benefits. Not only have I identified this submarket in my own observations and ethnography, but direct sources within the NFT market reference it frequently, even using the term “art-only” or slight variations of that term.<sup>20</sup> There are a large variety of art-only NFTs:
- (a) Some are created by artists or creators who are already well known; others are developed by artists or creators who first established themselves within the NFT space.
  - (b) Some of the works distributed in this way fall into what we might naturally think of as fine/contemporary art categories; others are pop art, cartoons, or other formats.
  - (c) Some art-only NFTs are marketed and sold as unique artworks, referred to as “1/1”s or “one-of-ones.” Others may be sold in artwork series or collections. And still others are framed more as collectibles. Fidenzas and “Everydays: The First 5,000 Days” are art-only NFTs that were explicitly framed as works of fine art; the latter was even sold in a standard art auction. The NFTheo collection (Figure 5, below), meanwhile, comprise an art-only NFT series marketed more as digital collectibles, with explicitly defined characteristics and features of varying rarities.
  - (d) Some art-only NFTs hold their primary sales on platforms focused on the art market, such as Art Blocks or SuperRare. Others run primary sales through private websites, or through the NFT minting services on platforms such as OpenSea or Manifold.
  - (e) These days, art-only NFT projects may explicitly label themselves as such, as a way of setting expectations among holders. In particular, creators of art-only NFTs may go out of their way to express that holders should *not* expect any form of utility to come with holding the NFT. The NFTheo collection, for example, declares on its OpenSea page: “NFTheo is an art project of 3000 unique NFT Teddy Bears. Every Theo is one of a kind. This project is entirely about the art, so manage your expectations accordingly.” (See Figure 5.)

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<sup>20</sup>See, e.g., <https://www.metamastersmedia.io/2022/08/03/chapter-2-1-tools-for-art-only-nfts/>, <https://nounstown.shop/collections/noadz-merch/nft>, or <https://medium.com/thingdoms/vaynersports-pass-x-thingdoms-c2d845be113d/>. *Disclosure: I am advisor to Thingdoms and hold a number of their NFTs.*

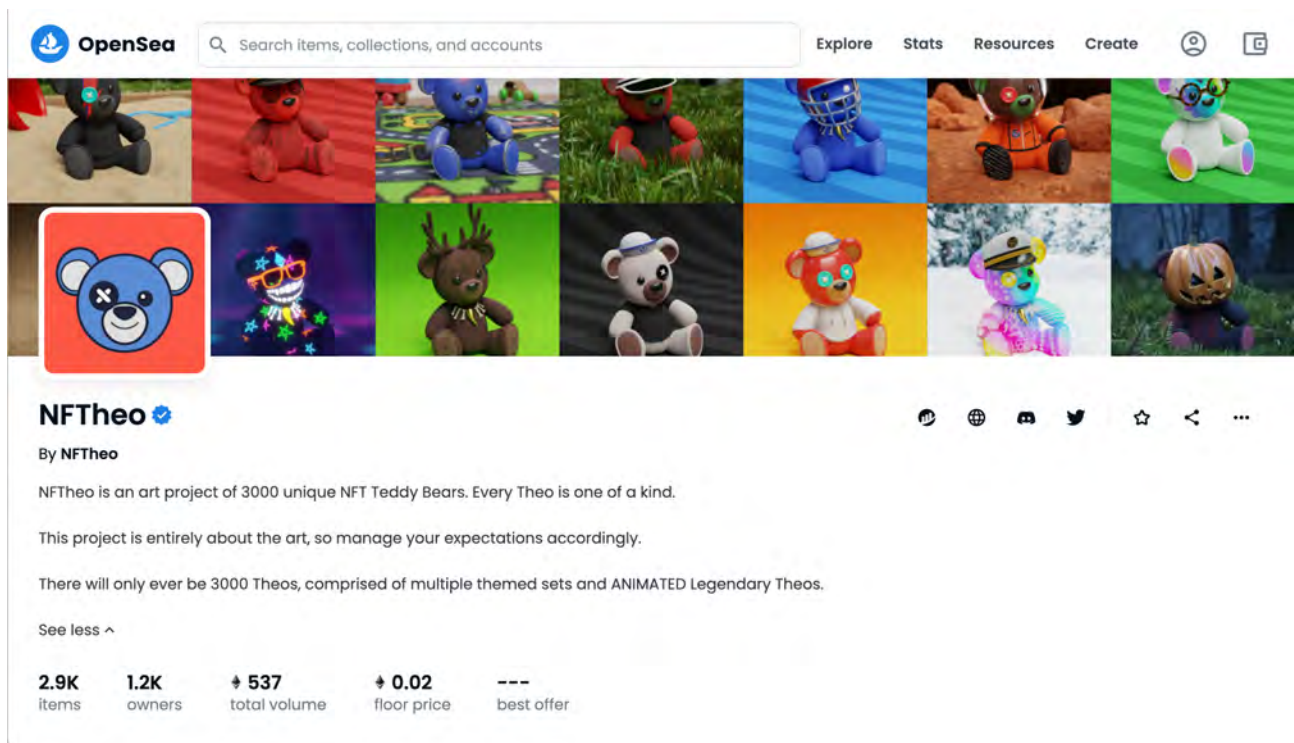


Figure 5: The OpenSea page of NFTTheo, which specifically describes the project as an art-only NFT collection.

## Digital Brand NFTs

41. Other NFTs use digital art, imagery, or similar as a springboard for establishing a broader product ecosystem, holder community, and digital brand. In this “digital brand” submarket—my term, although NFTs in this submarket often explicitly speak of aspirations to become “global brands”<sup>2122</sup>—NFT projects often launch with an NFT collection built around a specific digital asset (or asset series), style, and/or theme that characterizes the brand. The project then expands on that initial series by adding various forms of utility and additional brand assets.
  - (a) Sometimes, the growth plan is codified in a public “roadmap” (see example in Figure 6) which—akin to the product roadmap of a software/technology startup—provides a description and rough timeline of planned additions to the ecosystem associated to the NFTs. In other projects, the elements of the ecosystem are only revealed over time; in my interactions with various NFT projects and creators, I have seen “hidden roadmaps” sometimes used as an intentional strategic choice to maintain mystery, and other times to provide flexibility to their creator, who may not have fully finalized their ecosystem plan in advance.
  - (b) One particularly popular digital brand NFT category has been “PFP” NFTs (standing for “Picture for Proof,” but also colloquially interpreted as meaning “ProFile Picture”). In these projects, holders are encouraged to use the NFT artworks as their profile pictures on social media platforms, serving as both a signifier of membership and an implicit advertisement/invitation to others to join the community. This type of project has become

<sup>21</sup>Thingdoms. Thingpaper. *Medium*, Dec. 2021. [medium.com/thingdoms/thingpaper-1a9f6b60904c](https://medium.com/thingdoms/thingpaper-1a9f6b60904c).

<sup>22</sup>Disclosure: As mentioned above, I am advisor to Thingdoms and hold a number of their NFTs.

so widespread that the social media platform Twitter recently introduced a functionality that allows people to directly load an NFT as their Twitter profile picture from their crypto wallet<sup>23</sup>. Profile pictures loaded this way are displayed in a special hexagon format that serves as a quickly identifiable proof of ownership of the underlying NFT.

- (c) The most successful of these projects can achieve aggregate token valuations in the millions of dollars, or more. One of the most successful PFP NFT projects, the Bored Ape Yacht Club (mentioned above), has entered the public zeitgeist and is now a global brand, with both digital and physical assets, as well as a large-scale metaverse game in development and an annual “ApeFest” extravaganza. Individual NFTs in the original Bored Ape Yacht Club collection often sell in the hundreds of thousands to millions of dollars. As already mentioned above, the Bored Ape Yacht Club launched initially with just a series of cartoon ape image NFTs; however, they also presented and quickly executed on a number of merchandise, event, and NFT projects, and are now building many more.

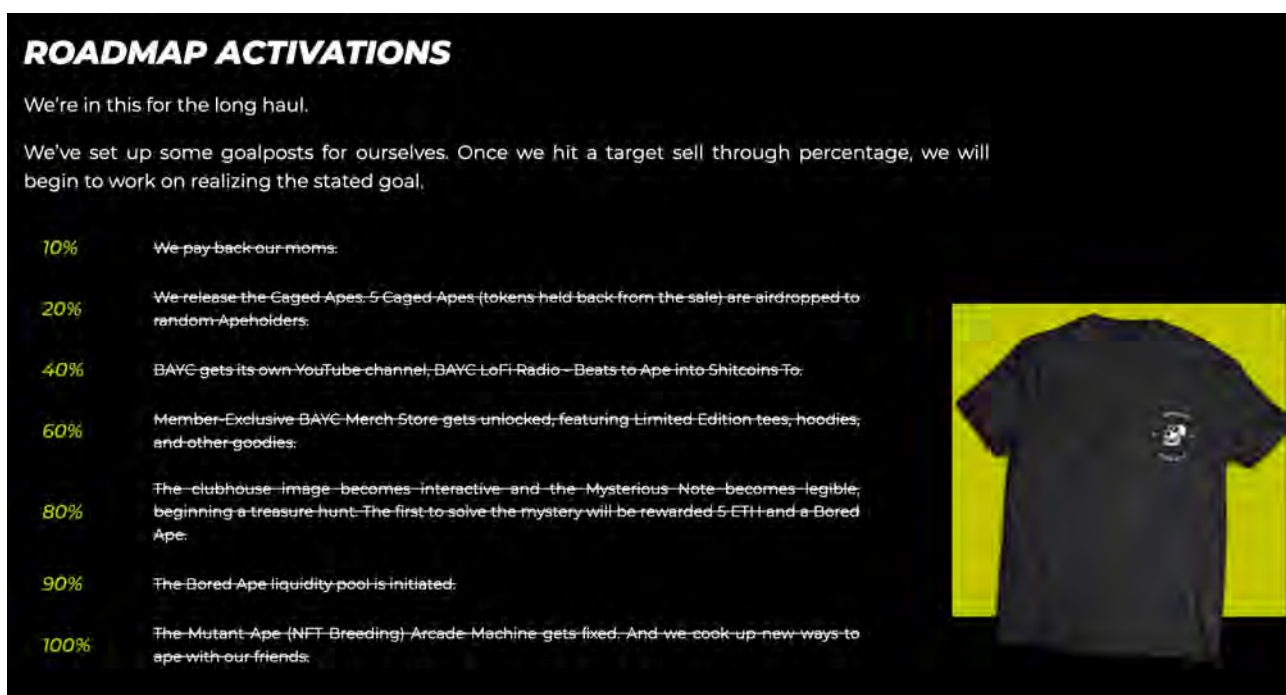


Figure 6: A screenshot of the Original Bored Ape Yacht Club Roadmap, as of August, 2022 from their website.

- (d) Another PFP NFT collection is GoblinTown, which explicitly promised “No roadmap. [...] No utility.”<sup>24</sup>; yet followers of the project quickly learned that the team managing the project *did* seem to have an internal roadmap with utility planned—starting with an airdrop of a follow-on NFT called the “McGoblinBurger,” an explicit parody of the McDonald’s burger. GoblinTown has since also to some extent become a global brand, now with themed merchandise available to the public. Figure 7 shows a sweatshirt for purchase that requires owning an NFT of theirs to buy.

<sup>23</sup>Aguilar, Nelson. How to turn your NFT into a verified profile picture on Twitter. *CNET*, Jan. 2022. [www.cnet.com/personal-finance/crypto/how-to-turn-your-nft-into-a-verified-profile-picture-on-twitter/](https://www.cnet.com/personal-finance/crypto/how-to-turn-your-nft-into-a-verified-profile-picture-on-twitter/).

<sup>24</sup><https://goblintown.wtf/>





Figure 7: A goblintown sweatshirt that requires a Goblintown NFT to purchase.

42. Creators of art-only NFTs do sometimes engage in social media and community building activities around their NFT projects. A key distinction from the digital brand NFTs, however, is that in the art-only NFT submarket, community engagement activities typically focus more centrally on the art itself, as well as its appearance in media, galleries, and other settings—and of course, effectively by definition, art-only projects do not make reference to utility. Figure 8 demonstrates a representative post on the Twitter page of the popular NFT artist who created the Fidenza series; the focus of the post is on a chance to see his art.
  - (a) That said, creators of art-only projects sometimes later discover a desire to build broader ecosystems and brands around their works. Moreover, especially given the prevalence of NFT traders who are hoping to see the individual NFTs they hold increase in value in the short- and medium-term, art-only NFT creators may face market pressure to introduce utility, or at least engage in active brand-building that may raise the public profile of the work. Thus, some NFT projects that start out as “art-only” are eventually converted or leveraged into broader NFT ecosystems, with utility and other features—often transitioning towards a digital brand. Hangry Hippos, a relatively under-the-radar NFT project that initially touted “the absence of utility and the developers’ decision to make this strictly art-based”<sup>25</sup> has later aimed to provide a variety of utility including access to metaverse land and an exclusive online trend tracker.<sup>26</sup>
  - (b) This conversion from art-only to digital brand can also occasionally happen without the active engagement of the original artist. For example, the “mfers” NFT project was both

<sup>25</sup><https://www.benzinga.com/pressreleases/22/03/ab26338037/the-hangry-hippo-nft-is-locked-loaded-raring-to-go>

<sup>26</sup><https://www.hangryhippo.io/>

launched as an art-only project, without any active support from the original creator, but soon developed “unofficial” communities with community leads and moderators, who put in place significant organizational structure and led a number of engagement activities.<sup>27</sup>



Figure 8: Popular NFT artist Tyler Hobbs advertising his art in a Twitter post.

43. One cross-cutting theme I have found—and the literature reflects—is that many NFT projects see themselves in part as contributing to holders’ personal identities in digital space. This is especially true for digital brand NFTs such as PFP projects, and as a result, many of these NFT projects introduce metaverse-ready extensions or representations of their NFT assets, which are then provided to holders.
  - (a) The SupDucks NFT project, for example, is one of many NFT projects that has introduced “voxelized” 3D renditions of its original 2D NFT assets; the intent is that owners will be able to use the 3D renditions as avatars in various metaverse platforms.<sup>28</sup>
  - (b) For another example, the Chain Runners NFT project is providing metaverse-ready 3D character models to holders of its “XR” collection. (Each holder of the original Chain

<sup>27</sup>sartoshi. What are mfers. *Mirror*, Feb. 2022. [mirror.xyz/sartoshi.eth/QukjtL1076-1SEoNJuqyc-x4Ut2v8\\_TocKkszo-S\\_nU](https://mirror.xyz/sartoshi.eth/QukjtL1076-1SEoNJuqyc-x4Ut2v8_TocKkszo-S_nU).

<sup>28</sup>Disclosure: As mentioned above, I hold SupDucks NFTs (and other NFTs from their digital brand ecosystem).

Runners collection was given an associated XR, and additional XRs were sold in a public mint process.)<sup>29</sup>

- (c) These metaverse-ready extensions are sometimes direct representations of the characters in the original NFT collection, as with the SupDucks and Chain Runners examples just discussed. In other cases, NFT projects will introduce metaverse assets that extend the original collection by introducing new items or characters based around the collection's overarching brand. The Bushidos NFT project, for example, recently gave holders of their 2D Bushido NFTs the opportunity to acquire 3D voxelized swords for use in a metaverse platform called The Sandbox.<sup>30</sup>
- (d) These metaverse-ready extensions are sometimes provided to holders free of charge, as in the case of the Chain Runners' 3D models; they can also be sold for project-specific cryptocurrency (the voxelized SupDucks were sold using the project's internal currency called Volt). In other cases, NFT projects make their metaverse-ready extensions available through a new primary market sale. Projects may also use mixtures of these strategies—Bushidos gave the sword NFTs to their existing holders, but also sold a variety of other Bushidos metaverse assets in a primary market sale through The Sandbox's marketplace.

## NFTs Associated to Established Brands

44. While some NFTs, such as the Bored Ape Yacht Club and the other PFP NFTs described earlier, introduce novel intellectual property and then use that to drive community engagement and value creation contributes to overall brand-building, these NFT business models can also be used by established brands. Indeed, a number of established brands have successfully launched NFT projects (examples below); this can promote increased engagement among their brand enthusiasts, especially in digital spaces such as social media and metaverse platforms.<sup>31</sup>

- (a) These NFT projects a variety of purposes for the brand: For example, they provide brand enthusiasts with a platform to discover and communicate with each other, through token-gated chat channels. They also provide a mechanism for generating brand awareness among new audiences—an opportunity that is particularly strong right now given that the number of brands that have issued NFT properties to date is relatively small, meaning there is less competition for consumers' attention. (I myself first discovered streetwear brand The Hundreds through learning about its NFT series, which I discuss further below.) Launching an NFT project also provides brands with a springboard to enter into other novel digital product categories. And of course many of these branded NFT projects also provide a direct source of revenue, through both primary and secondary sales.<sup>32</sup>
- (b) These projects have varied in the extent to which they build the NFTs around existing brand assets versus developing new, NFT-native assets.<sup>33</sup> Nevertheless, NFT projects

<sup>29</sup> Disclosure: I hold Chain Runner NFTs (and other NFTs from their digital brand ecosystem).

<sup>30</sup> Disclosure: I hold Bushido NFTs (and other NFTs from their digital brand ecosystem).

<sup>31</sup> Anatoli Colicev, "How can non-fungible tokens bring value to brands", *International Journal of Research in Marketing*, doi:<https://doi.org/10.1016/j.ijresmar.2022.07.003>, 2022; Arun Sundararajan, "How Your Brand Should Use NFTs", *Harvard Business Review*, 2022.

<sup>32</sup> Colicev.

<sup>33</sup> Sundararajan.

launched by established brands are typically linked to the underlying brand by reference to the brand's standard marks or signifiers.

- (c) Established brands often build value for their NFTs by way of strategies similar to those we see with NFT projects built on novel intellectual property in the digital brand submarket. Brands often actively promote engagement among their communities of holders—even Macy's maintains a Discord chat channel for holders of its NFT series<sup>34</sup>—and they seek to imbue their NFTs with various forms of utility.<sup>35</sup> In this sense, they are often effectively creating digital brand NFTs associated to their already established brand.<sup>36</sup> In the context of an established brand, these activities not only drive value to the NFTs, but also can reinforce enthusiasm for the brand itself. For example, as Jad Esber and I recounted in *Harvard Business Review*, “The Hundreds, a popular streetwear brand, recently sold NFTs themed around their mascot, the ‘Adam Bomb.’ Holding one of these NFTs gives access to community events and exclusive merchandise, providing a way for the brand’s fans to meet and engage with each other—and thus reinforcing their enthusiasm. The Hundreds also spontaneously announced that it would pay royalties (in store credit) to owners of the NFTs associated to Adam Bombs that were used in some of its clothing collections. This made it roughly as if you could have part ownership in the Ralph Lauren emblem, and every new line of polos that used that emblem would give you a dividend. Partially decentralizing the brand’s value in this way led The Hundreds’s community to feel even more attached to the IP and to go out of their way to promote it—to the point that some community members even got Adam Bomb tattoos.”<sup>3738</sup>
- (d) One key distinction in the case of NFTs associated to established brands, however, is that whereas a number of NFT-native brands have chosen to grant their holders significant (or even complete) intellectual property rights over the NFTs they own, established brands typically retain intellectual property ownership over the marks and other assets used in their NFTs. For example, The Hundreds explicitly addresses this in their frequently asked questions page for the Adam Bomb Squad NFT project:<sup>39</sup> “Since I bought an Adam Bomb Squad NFT, does that mean I have the rights to this design? No. Our NFTs do not transfer over any rights or licensing to the intellectual property. These are collectibles. Just like if you buy an original painting, you can’t go out and sell replicas of the artwork. And if you buy a pair of Nike shoes, you don’t own the Swoosh design.”<sup>40</sup> Another streetwear brand, Pink Dolphin, has a closely analogous policy for their NFT project Rare Ghost Club: “Since I bought an RGC NFT, do I own the rights to the design? No. [These] NFTs do not transfer over any rights or licensing to the intellectual property. These are collectibles. Just like if you buy an original painting, you can’t go out and sell replicas of the artwork. Although, we are working on a program where you can receive royalties based on the Ghost image you own. Please join the discussion in our discord for more

<sup>34</sup><https://www.macysinc.com/investors/news-events/press-releases/detail/1764/macys-launches-discord-channel-and-new-nft-series-in>

<sup>35</sup>Colicev.

<sup>36</sup>Colicev; Sundararajan.

<sup>37</sup>Esber and Kominers.

<sup>38</sup>*Disclosure: As mentioned above, I hold Adam Bomb Squad NFTs.*

<sup>39</sup>*Disclosure: As mentioned above, I hold Adam Bomb Squad NFTs.*

<sup>40</sup><https://www.adambombsquad.com/faq>



info.”<sup>41</sup>

- (e) Established brands bring recognizable brand value to their NFTs, and often also bring their pre-existing communities of enthusiasts. Likewise, in their utility efforts, brands often have some advantage because they can provide access to existing brand features or products as a form of utility. All of these features can raise the potential value of established brands’ NFTs in the NFT market.
- (f) Moreover, a particular strategic advantage established brands have when launching NFT projects is the potential for demand from consumers of the brand’s non-NFT products, who want to be able to showcase their enthusiasm for the brand in novel digital spaces. Standard economic theory predicts that demand of this type is likely to increase both as more consumers of those brands’ physical products enter the NFT market, and as people start to present more facets of their personal identities in digital spaces.
- (g) A number of fashion brands have successfully launched NFT projects based on their brand assets. In addition to The Hundreds, brands such as Adidas, Gucci, and Nike have developed NFT projects, which showcase everything from classic brand icons to novel, futuristic digital re-conceptions of the brand’s products. These products benefit from widespread brand recognition, as well as the brands’ history of association with consumers’ personal identity and social status. Moreover, many NFT consumers are already existing (or aspirational) consumers of the brands’ physical-world products, which makes them particularly interested in having access to these products in digital spaces—to share with their other NFT friends on social media, for example, and potentially to showcase or “wear” in the metaverse.



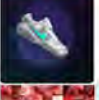


Brand	Name	Image	Launch	Mint Price (ETH, USD)		Avg Trade Price 1st Day (ETH, USD)		Avg Trade Price After 1 Month (ETH, USD)	
Gucci	SUPERGUCCI		Feb 1 2022	1.5,	\$4,188	12.3,	\$34,343	7.5,	\$21,259
Gucci	10KTF Grail		Mar 16 2022	air drop + (1, \$2,772)		1.61,	\$4,463	1.2,	\$3,675
Nike	Cryptokicks		Feb 5 2022	Airdrop to clonex holders		3.35,	\$10,099	4.45,	\$11,115
Adidas	Prada Re-source		Jan 28 2022	0,	\$0	0.59,	\$1,510	0.16,	\$461
Adidas	Into Metaverse		Dec 17 2021	0.2,	\$776	0.58,	\$2,254	0.78,	\$2493

Figure 9: Some fashion brands and prices of their various NFTs.

45. Metaverse fashion, specifically is a popular and growing product category, and, as described above, metaverse assets are often released as extensions of existing NFT projects. Introducing metaverse assets is thus a particularly natural strategy for fashion brands’ NFT projects, and many of them have already done so (or announced plans to do so).

<sup>41</sup><https://www.rareghostclub.com/>

- (a) As Bobby Hundreds explained in his essay “The Street Does Not Exist,” “brands are already designing clothing for the metaverse. The social status aspect of fashion is on the move from cotton to pixels. Video games have been doing this for years. My children are well-practiced in shopping for digital outfits in games like Fortnite, more conscious of their Valorant skins than the types of T-shirts they wear on the playground. Shops like BNV.me, artists like Stephy Fung, and sneaker brands like RTFKT are creating and selling metaverse fashion that run parallel to what you might find stocked at Dover Street Market. Virgil Abloh recently hinted that he is working on dressing you for the next world with the help of venture capitalist and essayist Matthew Ball.”<sup>42</sup>
- (b) Some branded fashion metaverse assets command significant prices in the NFT market. As shown in Figure 10, these prices can sometimes be significantly higher than seemingly similar non-branded assets. Likewise, the sale prices of artworks branded collections can be higher even when the artworks themselves are created by established NFT artists; see Figure 11 for the case of the Gucci Vault NFT series.



Figure 10: Left: A t-shirt NFT from Sewer Rat Club Social Wearables currently buyable for \$1.52. Right: A Decentraland t-shirt wearable NFT that last sold for approximately \$400.

Name Of Art Piece	Artist	Highest Gucci Vault Sale Price (ETH, USD)		Highest Other Sale Found by Artist (ETH, USD)		Name Of Other Piece	Factor
The Gucci Astronaut	Aliendope	2.66,	\$3,599	.26,	\$584	Deconstruct portrait #3	6.16
Tropic of Capricorn	Alexis Christodoulou	3.63,	\$5,498	.45,	\$1,885	Sick Bay # 42	2.91
Last Tickets to Earth	Diberkato	4.4,	\$4,601	15,	\$49,840	"3 AM"	0.09
Behind the Waterfall	Darta Katrina	2.5,	\$2,990	.2	\$844	Life in Green Green Grass	3.54
Moonlight Romance	Antoni Tudisco	10.25,	\$12,257	5.5,	\$13,456	Punks & Apes #4	0.91
Blockbob GG2	EBOY	6.6,	\$8931	3.9,	\$11,925	CIPX 090	0.75
Black And White Illusion	Tim Maxwell	3.0,	\$4732	3.3,	\$10,690	Cowards of Babel	0.44
Collect	Loudsqueak	3.0,	\$4682	1.91,	\$991	Conversation	4.72
Imminent Nostalgia	Alienqueen	15,	\$ 23,704	10,	\$19,613	Life's a Trip	1.21
The Red Hunter	Vexx	25,	\$ 30,589	24.76	\$ 55,220	Metadragon	0.55

Figure 11: Comparing sale prices of Gucci Vault Artists' work inside and outside Gucci Vault collection.

<sup>42</sup><https://thehundreds.com/blogs/monologue/thestreet>

- (c) The same is true in the closely related metaverse platform ROBLOX, which operates a private market for buying and selling digital assets. Digital Gucci handbags created for ROBLOX have sold for thousands of dollars<sup>43</sup>; market commentators are thus predicting similar sale prices for a forthcoming ROBLOX digital handbag release from Burberry.<sup>44</sup> Non-branded ROBLOX handbags, by contrast, often have prices on the order of \$5 or less. See Figure 12.

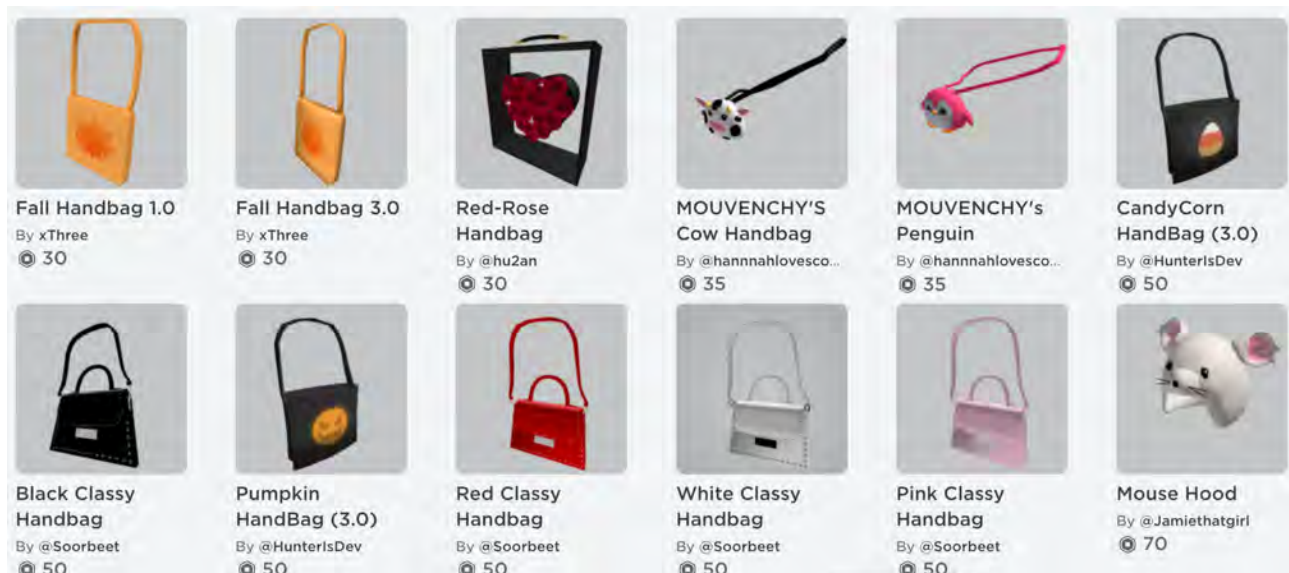


Figure 12: Some Roblox handbags, where the currency, a “Robux”, is currently worth approximately 1.5 cents.

- (d) Note that fashion NFT projects also sometimes involve a combination of physical and digital assets. Tiffany’s, for example, just recently announced an NFT project called NFTiff in which holders of NFTiff NFTs who also hold a CryptoPunk NFT will be able to redeem their NFTiff for both a Tiffany’s pendant of their CryptoPunk and an NFT of pendant. The primary sale price for the NFTiff was set at 30 ETH (roughly \$50,000 at the time of the announcement).<sup>45</sup>

## The Baby Birkin, MetaBirkins, and I Like You, You’re Weird NFT Projects

46. The Baby Birkin was a one-of-one NFT created by Mason Rothschild and a collaborator of his, Eric Ramirez, and sold via the e-commerce platform Basic.Space. A reference to the official Birkin 25 handbag, known colloquially as the “Baby Birkin” for its size, Rothschild’s Baby Birkin is a video NFT depicting a baby growing in a Birkin-Bag like womb, described by

<sup>43</sup><https://www.thefashionlaw.com/a-digital-only-gucci-bag-sold-for-4115-on-roblox-as-brands-continue-to-look-to-gaming-as-reach-gen-z/>

<sup>44</sup><https://www.inputmag.com/style/burberry-roblox-lola-handbags-avatar.>

<sup>45</sup><https://nft.tiffany.com/>

Rothschild as “a literal take on the words Baby Birkin.”<sup>46</sup> It was initially sold for \$23,500 to someone with the pseudonym “Aki Hayashi” on May 20, 2021. To my knowledge, nothing was sold or promised besides the video, which was displayed publicly both on the Basic.Space platform and while the NFT was being advertised on various news outlets and Twitter. And to my knowledge, no further utility or features were added to the NFT after the sale. Thus, the Baby Birkin had many of the attributes of an art-only NFT.



Figure 13: Two MetaBirkins, #0 (left) and #95 (right).

47. The MetaBirkins NFT project created by Mason Rothschild consists of 100 NFTs that were minted on December 2, 2021. Each NFT is associated to an image of a bag in the style of a Birkin handbag that has been textured to look fuzzy in various colors. Figure 13 provides a few examples.
- (a) The 100 tokens were minted via whitelist to 100 different addresses, each at a price of 0.1 ETH (approximately \$458 at time of minting), resulting in initial project revenue of 10 ETH (approximately \$45,800 at the time). Unlike the Baby Birkin, the MetaBirkins were distributed “unrevealed,” with the images associated each token being revealed after the inclusion of the whitelist mint (although samples of what the NFTs might look like had previously shared on various social media feeds).
  - (b) Rothschild supported the MetaBirkin project with a public Discord server, as well as a series of social media accounts associated to the project. At peak, the MetaBirkins Twitter account had more than 7,000 followers<sup>47</sup>; its Instagram page had more than 19,000<sup>48</sup>; the discord server had more than 16,000<sup>49</sup>; and Rothschild’s Twitter account, which also posted messaging about MetaBirkins, had more than 22,000.<sup>50</sup> Furthermore, according to Rothschild, TikTok videos about MetaBirkins amassed “millions of views.”<sup>51</sup>

<sup>46</sup>Silbert, Words By Jake and Jake SilbertNews Editor. The ‘baby birkin’ NFT just sold for more than the real thing. *Highsnobiety*, May 2021. [www.highsnobiety.com/p/baby-birkin-nft-basic-space/](https://www.highsnobiety.com/p/baby-birkin-nft-basic-space/).

<sup>47</sup><https://socialblade.com/twitter/user/metabirkins/monthly>

<sup>48</sup><https://socialblade.com/instagram/user/metabirkins/monthly>

<sup>49</sup>Rothschild009211.pdf, page 009217 from discovery

<sup>50</sup><https://socialblade.com/twitter/user/masonrothschild/monthly>

<sup>51</sup><https://twitter.com/MasonRothschild/status/1465181524895039489>



- (c) Some whitelist slots were distributed in giveaways entered by joining the MetaBirkins Discord server or following the MetaBirkins Twitter page—a strategy commonly used by NFT projects to boost their following and community engagement pre-mint. Outside of the original minting, 57 secondary sales of MetaBirkin NFTs (“MetaBirkins”) have thus far occurred, for between 10 Ethereum (approximately \$42,000 at the time of the trade) and 1 Ethereum (\$4,200).
  - (d) Rothschild indicated on Instagram that some MetaBirkin characteristics—particularly the locking mechanisms pictured in the center of each image—would have explicit rarity.
48. Rothschild encouraged MetaBirkin holders and enthusiasts to think of the MetaBirkin NFTs as significant investment assets that would deliver long-term value, explicitly drawing comparisons to value of the real Birkin handbags. In a Mirror post a few days before the MetaBirkins mint, for example, Rothschild wrote: “My goal is for MetaBirkins double as an investment for holders like the real-world ‘holy grail’ handbag” (Figure 14).<sup>52</sup>

## MetaBirkins

The [MetaBirkins community](#) has been growing by the hundreds daily and I can't be more thankful for all of your support. I minted the, one-of-one, [Baby Birkin](#) in May of this year with no expectations and now I'm sitting here making the final selections for the collection of one hundred. I began working on [MetaBirkins](#) in response to [fashion's latest "fur free" initiatives](#) and after catching a wave of positive reactions to a few sneak peeks on Instagram and Twitter, I knew I had to try and recreate the same exclusivity and demand of Hermès' most famous handbag. My goal is for MetaBirkins double as an investment for holders like the real-world “holy grail” handbag. Baby Birkin sold for \$23,500.00 at auction and received global publicity, a price and accomplishment I know MetaBirkins will eclipse in the hands of the right holders.

## Beyond

The Baby Birkin and MetaBirkins have all led up to this. This month, I assembled a team of Web3 developers and partnered with, quite possibly the most talented human being I know, [Amber Park](#), to begin work on a large-scale generative project minting in Q1 of 2022. I can't share too much information in these early stages of development but I will leave you with this:

- The first 1,000 MetaBirkins Discord server members will automatically be whitelisted for the generative project
- The top 10 longest MetaBirkins holders (at the time of the generative project minting) will be gifted an item from the generative project collection

Perks for those of you with the Founders role in the MetaBirkins Discord server will be announced as we develop this collection. Thank you all again, your early support will be rewarded.

Figure 14: Screenshot from Mirror article by Rothschild describing “MetaBirkins and Beyond.”

<sup>52</sup>Rothschild, Mason. Metabirkins and beyond. *Mirror*, Nov. 2021. [mirror . xyz / masonrothschild . eth / wnu9INib4HfIsLIITwzarSDtzOigfHHgdHepF3pjOQs](https://mirror.xyz/masonrothschild.eth/wnu9INib4HfIsLIITwzarSDtzOigfHHgdHepF3pjOQs).

49. While the Baby Birkin closely matched many of the characteristics of an art-only NFT, Rothschild explicitly promised various forms of utility to MetaBirkin holders—placing the MetaBirkins outside the art-only submarket. He also actively sought to build a community around the MetaBirkin NFTs, and to leverage that community in establishing a community around a second NFT project, I Like You, You’re Weird, discussed further below.
- (a) In the Mirror post cited above, he also wrote “The MetaBirkins community has been growing by the hundreds daily and I can’t be more thankful for all of your support.”<sup>53</sup> “This month, I assembled a team of Web3 developers and partnered with, quite possibly the most talented human being I know, Amber Park, to begin work on a large-scale generative project minting in Q1 of 2022. [...] The first 1,000 MetaBirkins Discord server members will automatically be whitelisted for the generative project[; t]he top 10 longest MetaBirkins holders (at the time of the generative project minting) will be gifted an item from the generative project collection[; p]erks for those of you with the Founders role in the MetaBirkins Discord server will be announced as we develop this collection. Thank you all again, your early support will be rewarded.”<sup>54</sup>
  - (b) Towards its community-building efforts, the MetaBirkins NFT project had (at least) three discord managers and two community moderators. Moreover, as already described above, Rothschild directly rewarded community engagement through whitelist access to the MetaBirkins mint. Additionally, according to private communications shared during discovery, Rothschild repeatedly sought deals with celebrity influencers to give them MetaBirkins whitelist access in exchange for social media posts about MetaBirkins that would reach their large numbers of followers.<sup>55</sup>
  - (c) Via Twitter, Rothschild also announced broad and unspecified utility for MetaBirkins holders in the form of access to future projects and airdrops: “MetaBirkins are the key to unlocking all my future projects. Guaranteed whitelists, guaranteed airdrops. Endless value for the people who believe in me and my work. It’s all about the journey and I’m just getting started.” (See Figure 15.)

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<sup>53</sup>Rothschild.

<sup>54</sup>Rothschild.

<sup>55</sup>See, for example, document Rothschild008800.pdf page 008801



Figure 15: A tweet from Rothschild's Twitter account, January 14, 2022.

- (d) Rothschild also appears to have granted top holders and original supporters of the MetaBirkins NFT project special access to his subsequent NFT project, I like You, You're Weird (ILYYW). As shown in Figure 16, all MetaBirkin holders were described as being entitled to one free ILYYW and the guaranteed opportunity to purchase three more ILYYW NFTs during the whitelist mint.

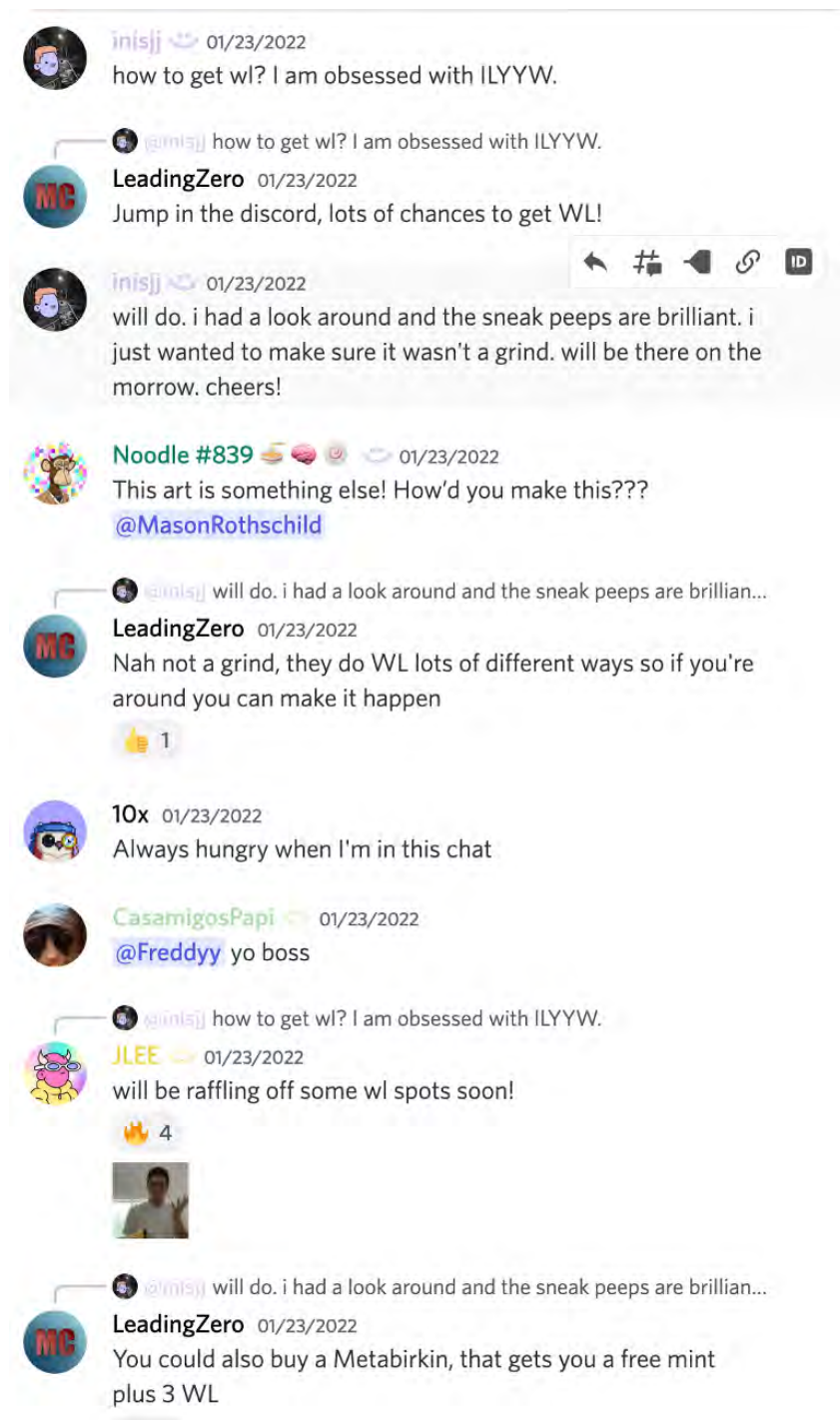


Figure 16: A screenshot from the Noodles Discord server, where user LeadingZero describes the ILYYW perks of owning a MetaBirkin.

50. Rothschild's public statements additionally suggest that he was planning to drive further value to the MetaBirkin NFTs through at least one airdrop.

- (a) Rothschild teased a secondary airdrop of an NFT based on another Hermès product—in this case, a horse-shaped bag charm that had been made fuzzy in a way similar to the



MetaBirkins that would match each MetaBirkin owner's bag NFT (see Figures 19 and 36). Conceptually, this would have been closely analogous to the way a number of digital brand NFTs extend their brand assets through a secondary collection. For example, the SupDucks airdrop of King Frog introduced a secondary NFT series borrowing and extending the brand elements from the main SupDucks collection; each SupDuck holder, in particular, was able to obtain a King Frog NFT that matched their SupDuck, as illustrated in Figure 17. (Rothchild also privately discussed a variation this secondary NFT could take, including a potential form of what we might call "transformative" utility, in which a purchased white horse charm NFT could be "burned" (effectively, deleted) to create a specialized horse charm NFT matched to the pattern of a given MetaBirkin bag, see Figure 18.)

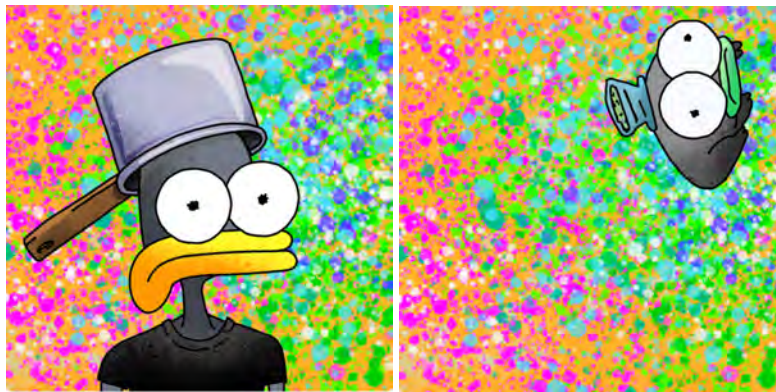


Figure 17: Supduck 6371 and corresponding King Frog 16371 (from my NFT collection).

After birkin release

Instant Message : WhatsApp

21:54:34

From

Mason Rothschild <+18082267000>

To

Mark Design <+38641742149>

Lets say a month later

Instant Message : WhatsApp

21:54:44

From

Mason Rothschild <+18082267000>

To

Mark Design <+38641742149>

We release 25 fluffy horses

Instant Message : WhatsApp

21:54:47

From

Mason Rothschild <+18082267000>

To

Mark Design <+38641742149>

All white

Instant Message : WhatsApp

21:54:58

From

Mason Rothschild <+18082267000>

To

Mark Design <+38641742149>

Owners of birkin who get the horse

Rothschild008467

Instant Message : WhatsApp

21:55:20

From

Mason Rothschild <+18082267000>

To

Mark Design <+38641742149>

Can burn the horse and get a fluffy horse to match their birkin

Figure 18: Text messages from Rothschild008467.pdf from discovery, in which he suggests the discussed transformation utility.

(b) Additionally, as mentioned above, Rothschild announced broad and unspecified utility for

MetaBirkins holders in the form of access to future projects and airdrops (Figure 15).

51. Meanwhile, and further consistent with the strategies of digital brand NFTs, the messaging and advertising Rothschild used to promote the MetaBirkins project focused on utility, community, and investment aspects as the core sources of value for the MetaBirkin NFTs.

- (a) Rothschild used social media to suggest ongoing and growing value for the MetaBirkins NFTs. He frequently touted future utility for MetaBirkins holders (Figure 19)—sometimes explicitly, and sometimes through vague hints.

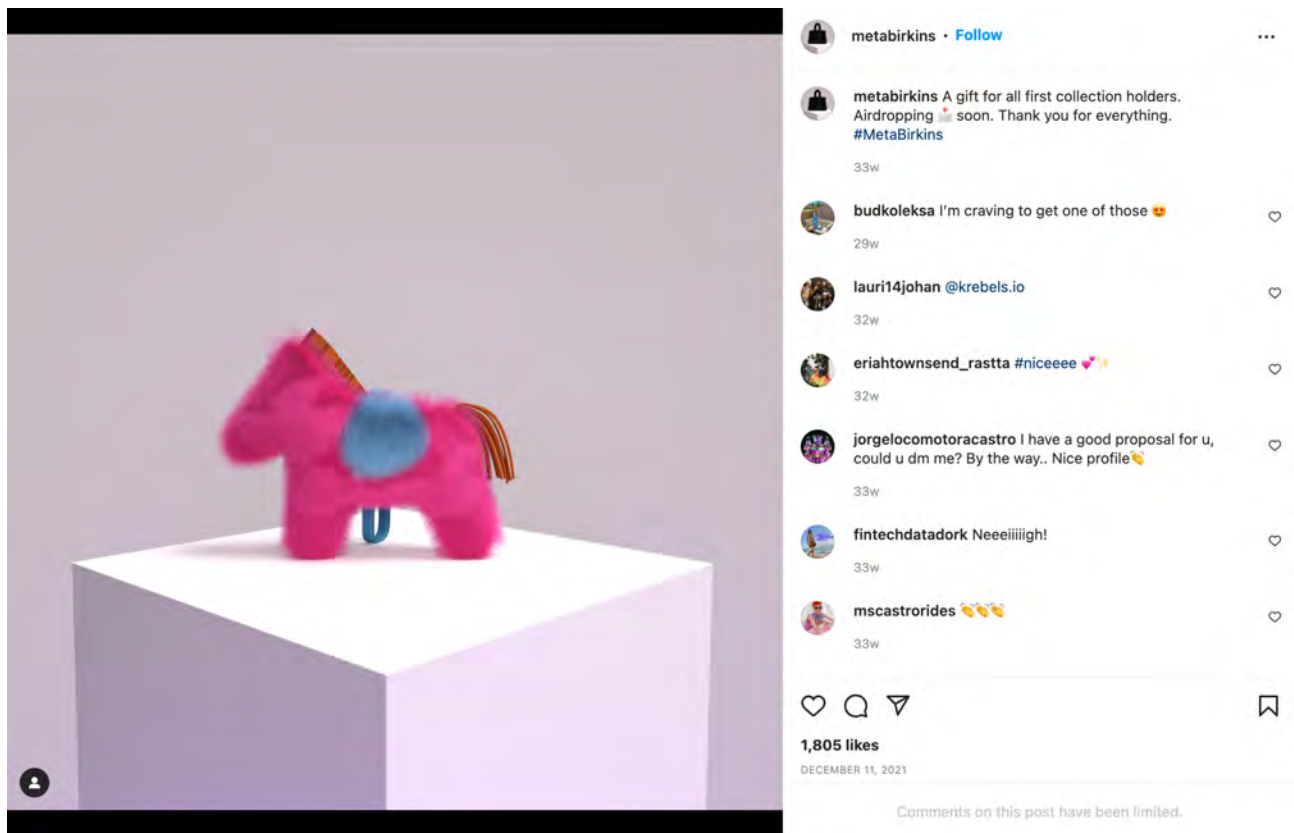


Figure 19: A post from the MetaBirkin’s Instagram page, promising a free airdrop to MetaBirkin holders.

- (b) In other postings, Rothschild highlighted recent MetaBirkin transactions and sale prices.
- (c) My impression is that throughout all of this messaging, Rothschild demonstrated significant facility with the common idioms, parlance, and social conventions of community-based NFT projects, which he presumably would have been familiar with through his own engagement in numerous NFT communities, and potentially through his broader work as a marketing strategist.
- (d) Note also that, at least in the materials reviewed, Rothschild generally did *not* make arguments that the art *per se* was likely to appreciate in value over time except inasmuch as public attention, community activity, and rewards would reinforce people’s desire to own the NFTs. Likewise, Rothschild appears to have rarely highlighted the “fur-free” artistic inspiration he asserted for the MetaBirkins.



52. Overall, the forms of utility Rothschild provided and promised MetaBirkins holders, as well as the community-building and promotional activities Rothschild undertook, are consistent with those of other NFT projects aspiring to be community-based digital brands.
53. Moreover, in both public and private statements, Rothschild drew explicit comparisons between the MetaBirkins and Bored Ape Yacht Club and Doodles, two of the most successful digital brand NFTs, suggesting that he wanted his followers to think of these collections' value similarly.
- (a) On his twitter feed, Rothschild posted:

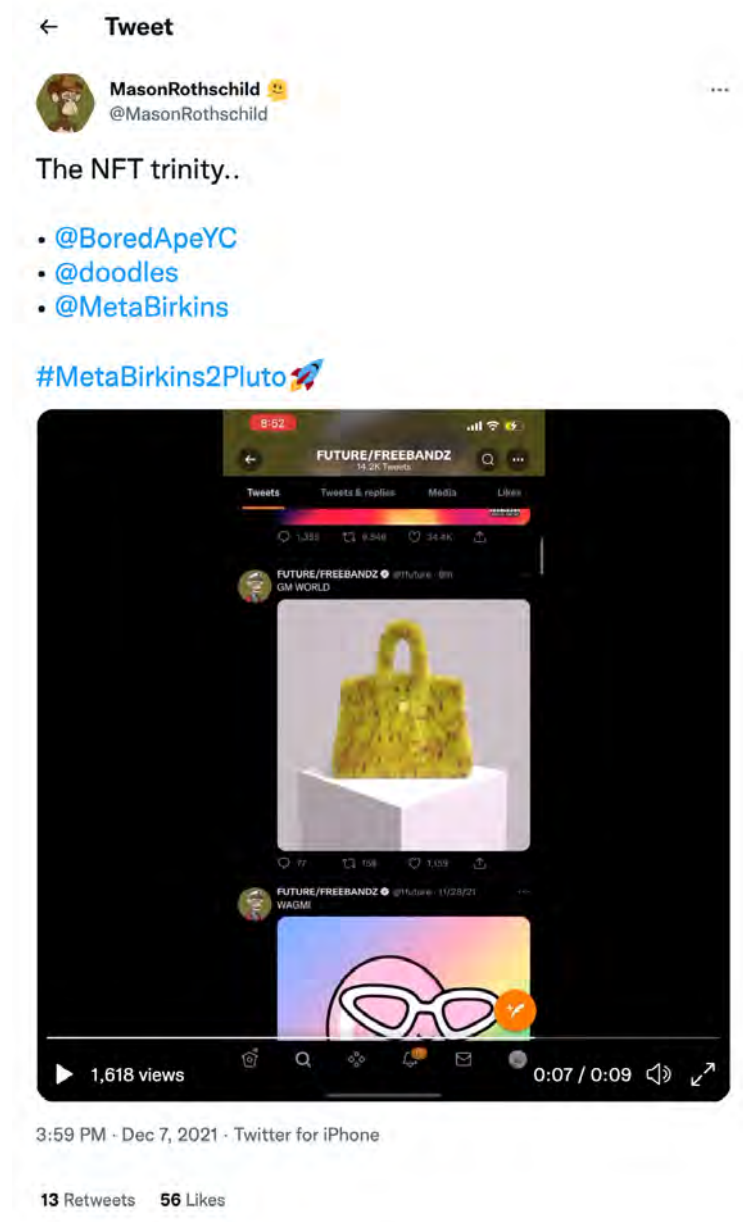


Figure 20: A Tweet from Rothschild juxtaposing MetaBirkins, Bored Ape Yacht Club, and Doodles.

While it is not clear what, precisely, Rothschild intended from the reference here other than

- an aspirational implication that the MetaBirkins would increase in value (“MetaBirkins2Pluto”) to reach towards the extremely high values attained by the Bored Ape Yacht Club and Doodles NFTs, this juxtaposition frames MetaBirkins within the digital brand submarket.
- (b) Note also that the fact that Bored Ape Yacht Club and Doodles NFT projects are built around imagery does not make them any less brands—just as Disney is a brand, and one of the principal products it sells is series of images featuring recognizable characters. Rothschild could instead have compared the MetaBirkins to top art-only NFTs such as Fidenza or work by XCOPY, but explicitly chose to frame the “Trinity” as comprising the MetaBirkins and two of the highest-value best-known digital brand NFTs.
54. Rothschild additionally used MetaBirkins to promote his subsequent NFT project ILYYW, which was explicitly advertised as a PFP NFT collection with various forms of utility, placing it solidly within the digital brand submarket. He also appears to have actively leveraged the MetaBirkins community into the ILYYW community.
- (a) ILYYW is an NFT PFP project comprising 10,000 tokens, known as “Weirdos,” that Rothschild conceived of in 2021 in collaboration with Amber Park. The collection was minted in early March, 2022. The art of these tokens was created using a generative process commonly used in PFP collections, in which various artistic attributes were randomly combined to create the unique Weirdos of varying rarity. ILYYW is in many ways a standard community-based PFP project, with a very active Discord, social media, and in-person events, as well as frequent online gatherings and interactions with other NFT communities. The project has a public roadmap, and gives frequent updates designed to provide utility to ILYYW holders and grow the community. ILYYW tokens were minted for a price of .1 ETH, and as of August 4, 2022 were trading at a floor of roughly .05 ETH.
- (b) The MetaBirkins project appears to have helped credential Rothschild as a well-known and established NFT creator, driving attention and engagement to ILYYW. Indeed, the ILYYW project was frequently recognized or even advertised as being from the creator of the MetaBirkins project; see, for example, Figure 21.

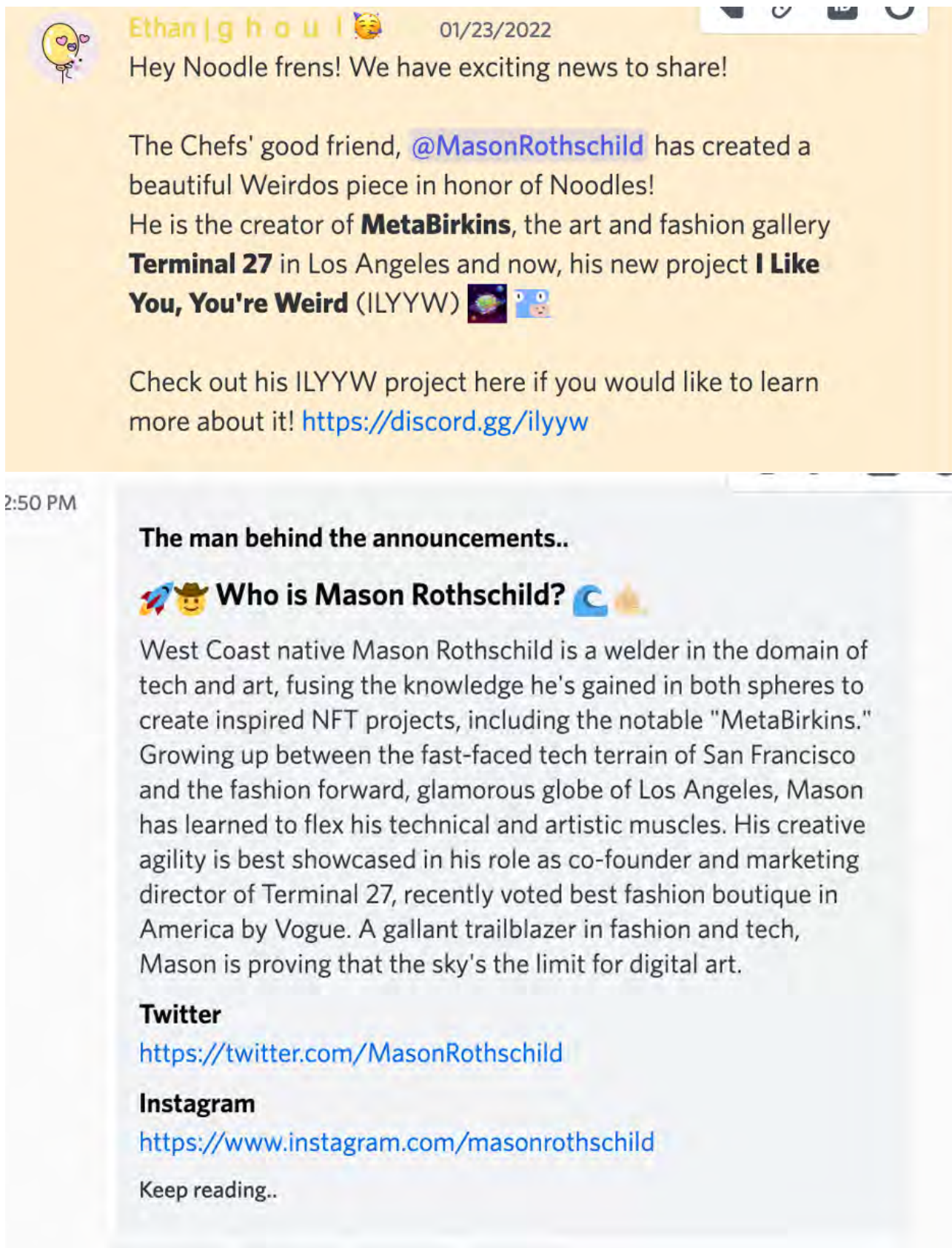


Figure 21: Top: Discord post promoting ILYYW and advertising Rothschild as the creator of MetaBirkins. Bottom: Rothschild's biography in the ILYYW Discord server, also mentioning MetaBirkins.

- (c) Moreover, the Mirror article posted before the MetaBirkins launch suggests that MetaBirkins and ILYYW were in effect one integrated project. Rothschild spoke of “MetaBirkins and Beyond,” and the “Beyond” being referenced was the ILYYW project (Figure 14).<sup>56</sup> Rothschild explained, “The Baby Birkin and MetaBirkins have all led up to this.” He then promised collection access for certain MetaBirkins holders and Discord server members, as described above, and added “Perks for those of you with the Founders role in the MetaBirkins Discord server will be announced as we develop this [ILYYW] collection. Thank you all again, your early support will be rewarded.”<sup>57</sup>
- (d) Moreover, the teams managing the MetaBirkins and ILYYW projects appear to have significant overlap. At minimum, the Discord users with usernames “Yara,” “Spenduehh,” “JLEE,” and “Donf” currently hold moderator roles in both the MetaBirkins and ILYYW Discord servers.

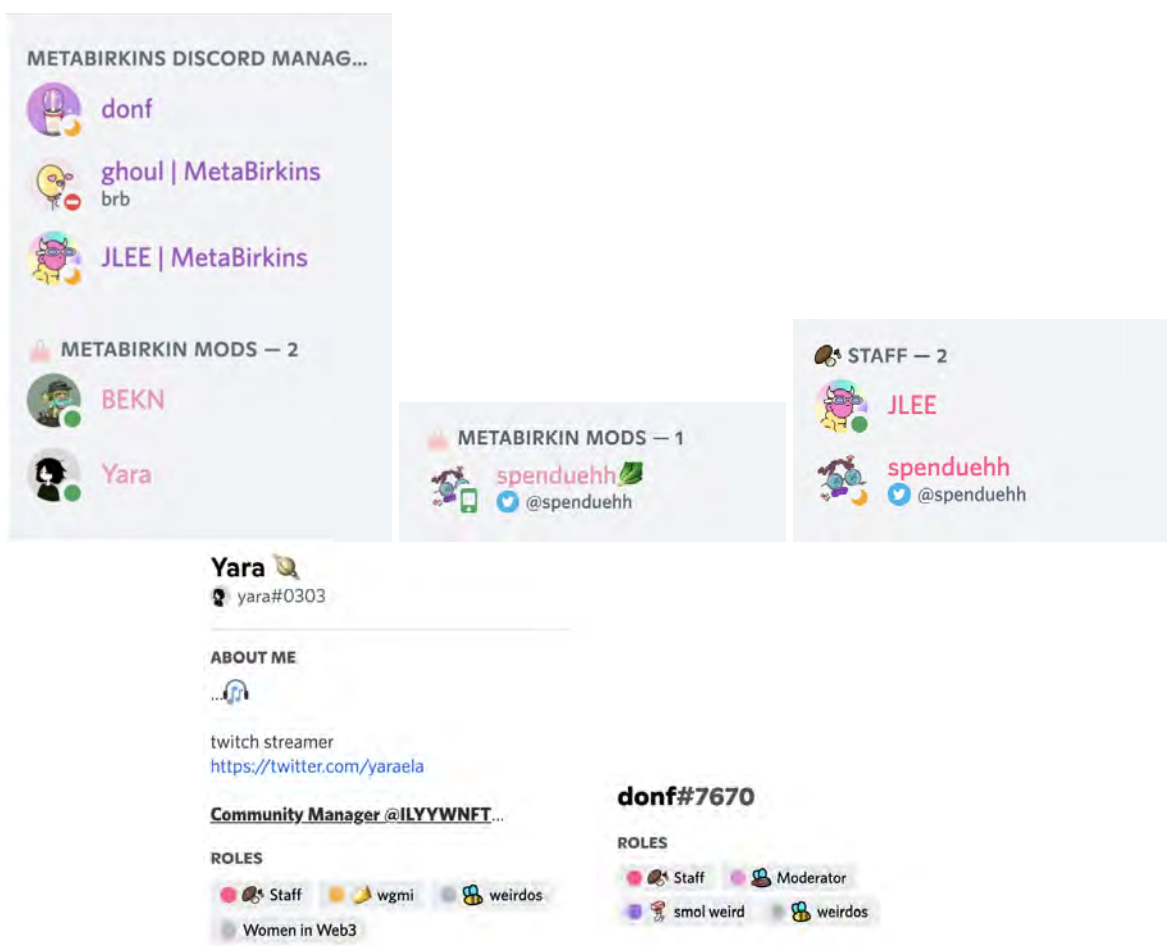


Figure 22: Top left and top middle: Some MetaBirkin Discord moderators and managers. Top right and bottom: Some ILYYW staff.

- (e) One moderator of the MetaBirkins Discord even directed a MetaBirkins Discord member to the ILYYW Discord to discuss the MetaBirkins project, explaining that Rothschild’s

<sup>56</sup>Rothschild.

<sup>57</sup>Rothschild.



lack of posting in the MetaBirkins Discord was due to the present lawsuit, see Figure 23.

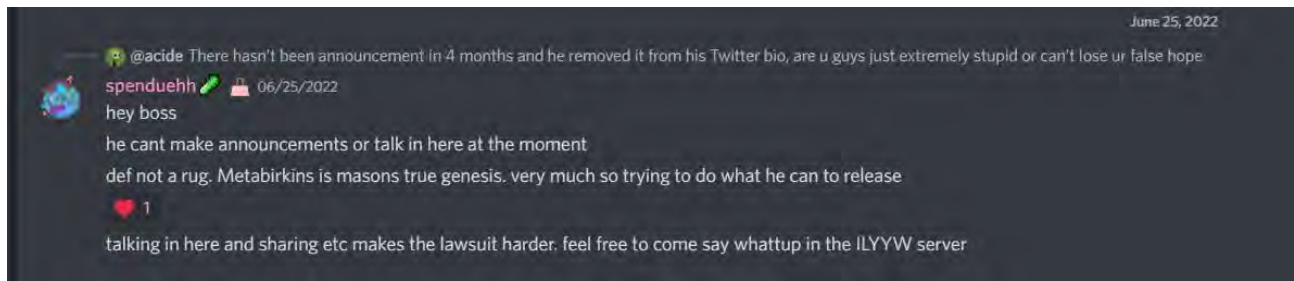


Figure 23: Discord message in the MetaBirkins Discord in which a moderator directs a Discord member to the ILYYW Discord.

- (f) The MetaBirkins Twitter account also consistently retweeted key posts from ILYYW to its followers, broadening ILYYW's social media reach and audience; see Figure 24.

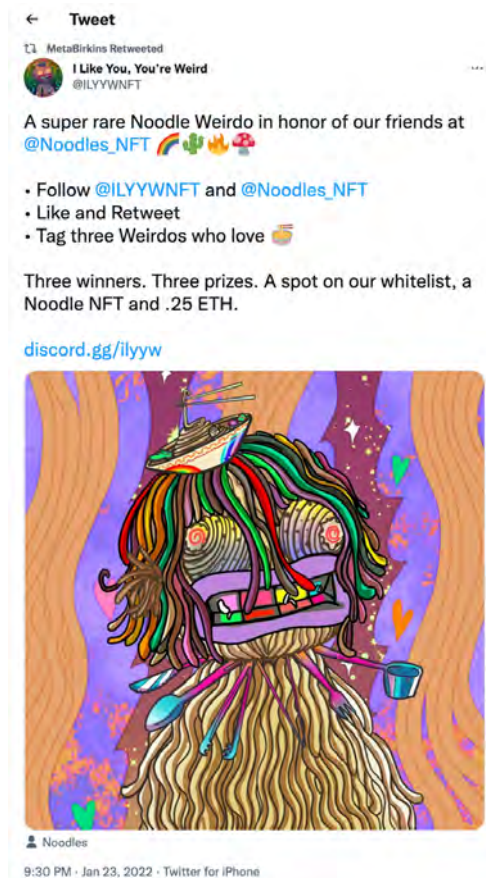


Figure 24: Example instance of the MetaBirkins Twitter account retweeting an ILYYW tweet.

- (g) And in private correspondence shared in discovery, Rothschild talked about directly pivoting from MetaBirkins to ILYYW (Figure 25).



Instant Message : Native Messages  
03:38:11

From  
Jesse Lee <+13105971344>  
To  
Mason Rothschild <mase@masonrothschild.com>  
Mason Rothschild <+18082267000>  
Alex Sacks <+13107134632>  
Truman Sacks <+13107303576>

How quickly do you think ILYYW can be ready? I think it might be best to have a plan to do final drop or wrap up metabirkins on a positive note w everyone involved. Then introduce / announce the new project simultaneously

Instant Message : Native Messages  
03:38:42

From  
Mason Rothschild <+18082267000>  
To  
Mason Rothschild <mase@masonrothschild.com>  
Alex Sacks <+13107134632>  
Truman Sacks <+13107303576>  
Jesse Lee <+13105971344>

Yeah thats what i was thinking

Instant Message : Native Messages  
03:38:49

From  
Mason Rothschild <+18082267000>  
To  
Mason Rothschild <mase@masonrothschild.com>  
Alex Sacks <+13107134632>  
Truman Sacks <+13107303576>  
Jesse Lee <+13105971344>

I'll be ready with ilyyw by end of jan

Figure 25: Document Rothschild009850 from discovery

55. Rothschild's strategies to promote the value of the ILYYW NFTs suggest a number of steps he might theoretically take to promote the value of the MetaBirkins brand if permitted to do so.
  - (a) Rothschild promised to expand the ILYYW collection through the addition of a secondary NFT collection—"pets." He also introduced a cross-project collaboration with another NFT project called Blankos to provide ILYYW holders with NFTs they can "bring [...] into the Blankos Block Party game as playable characters."<sup>58</sup>
  - (b) He also promised a "staking" mechanism, colloquially referred to as "nesting"—a reference to the staking mechanism developed by the Moonbirds NFT.<sup>59</sup> Staking mechanisms incentivize holders to take their NFTs out of circulation (typically by providing some sort of reward to doing so); this can decrease potential supply available in the market, which in turn may result in higher market prices. For ILYYW, the planned staking mechanism will be gamified, taking the form of a multi-layer tournament between entered weirdos.

<sup>58</sup><https://opensea.io/collection/blankos-ilyyw>

<sup>59</sup><https://nest.moonbirds.xyz/>

- (c) All of these strategies are common among various digital brand NFT projects,<sup>60</sup> although ILYYW may be slightly unusual in its simultaneous embrace of all of them. In my observation and experience of the NFT market, these sorts of activities are often perceived as value-increasing, at least when executed successfully. And by Rothschild’s own characterization, he timed announcements about these various forms of ILYYW utility to generate a “pump” in the market price and/or sales—which was pre-announced to ILYYW Discord members, see Figure 26.

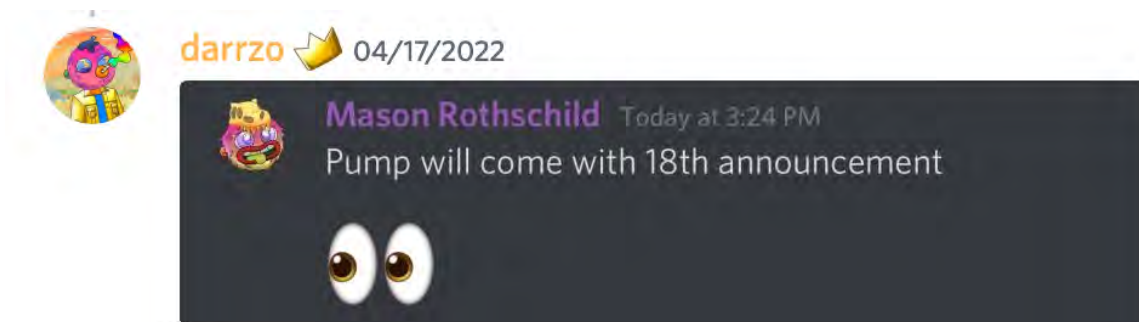


Figure 26: A screenshot of the ILYYW Discord from April 17, 2022, with reference to the expected “pump.”

- (d) Rothschild also developed and publicly advertised a “crossover” between the MetaBirkins and ILYYW projects in the form of MetaBirkin-style images with the bags patterned in the various motifs of the ILYYW project. In addition to using these to advertise the projects on social media (Figure 27), statements made by moderators in the ILYYW Discord suggest that Rothschild may be considering issuing these as digital assets in the future (Figure 28).

<sup>60</sup>see, e.g., <https://www.businesswire.com/news/home/20220131005280/en/NFTs-Get-Gamified-Cool-Cats-Launches-Cool-Pets-One-of-the-First-Crowdsourced-NFTs>, <https://nest.moonbirds.xyz/>, and <https://medium.com/thingdoms/vaynersports-pass-x-thingdoms-c2d845be113d>. *Disclosure: As mentioned above, I am advisor to Thingdoms and hold a number of their NFTs.*

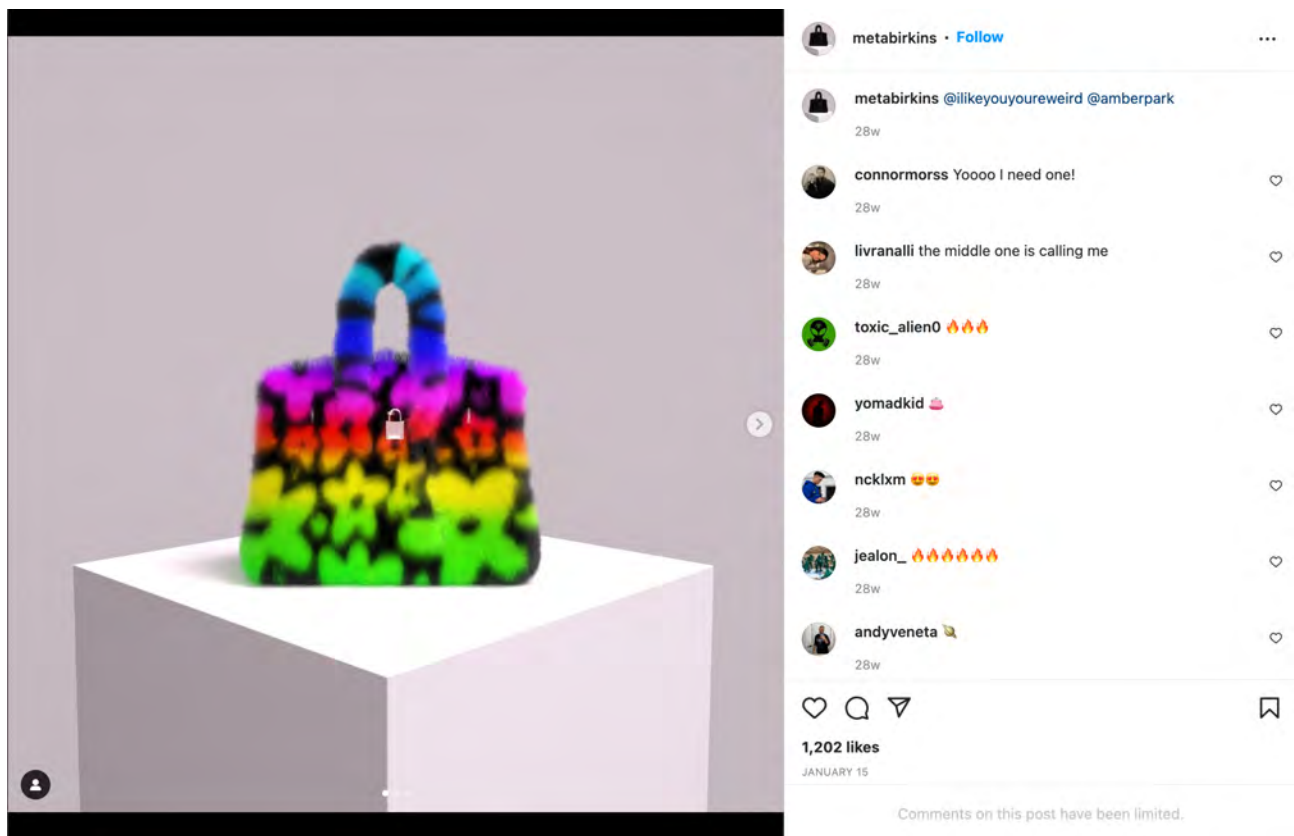


Figure 27: A post on the MetaBirkin Instagram page showing a crossover ILYYW MetaBirkin bag.

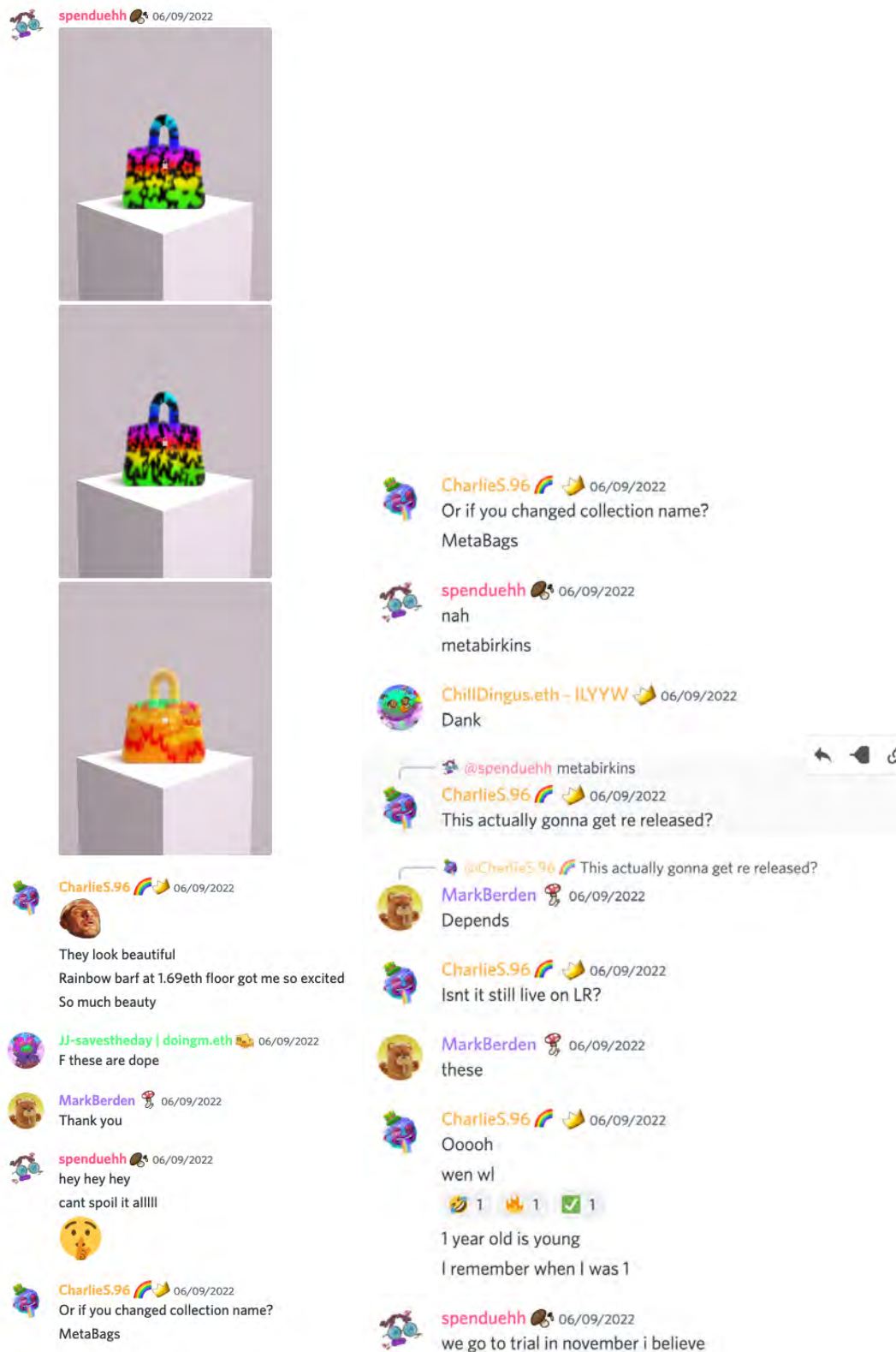


Figure 28: A discord conversation on the ILYYW discord where a moderator, Spenduehh, implies the results of the trial may affect future MetaBirkin releases. Left image directly precedes right image.

## Performance of the MetaBirkins Relative to Other Similar and/or Contemporaneous Projects

56. Empirical analysis of the price and trading history of the MetaBirkins tokens suggests these tokens had trading patterns most similar to NFT projects that were either associated to established brands or had significant upfront investment and prior audiences. The MetaBirkins' trading patterns were not found to be closely analogous to small-supply art-only NFT projects.
57. This analysis focused on the first 17 days of trading data from 413 tokens that were minted around the time of MetaBirkins.<sup>61</sup> (See Appendix 1 for the details of the analysis.)
58. First we looked at simple quantitative ranking measurements and comparisons among the projects. The results were as follows:
  - (a) Out of all 413 tokens, the average sale price in dollars over the first 17 days of trading was higher for MetaBirkins ( $\approx$ \$16,700) than for all but one other token, which was NeoTokyo Citizen ("a collection of VCs, developers, tokenfounders [sic], and overall builders [...]" "in short, a networking group for people who want to develop the gaming metaverse[...]"<sup>62</sup>) Figure 29 (which omits NeoTokyo Citizen because including it would have required compressing the scale) demonstrates how much higher MetaBirkins's average sale price was relative to most contemporaneous projects. The only other NFT within even 30% of the average of MetaBirkins and NeoTokyo Citizen is Mobland, a large cross-chain video project backed by, among others, the cofounder of the multibillion-dollar Twitch.tv platform.<sup>63</sup>

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<sup>61</sup>*Disclosure: I hold tokens from several of these collections: Illuminati, Hungry Wolves, the littles, CryptoRayRays, ParadiseTrippies, and BlankArt. I moreover serve as an advisor to Hungry Wolves.*

<sup>62</sup><https://neotokyo.codes/what-is-neo-tokyo>

<sup>63</sup><https://mob.land/>





Figure 29: Average sale price comparison of MetaBirkins and other contemporaneous tokens. Average sale prices were computed over the first 17 days of trading for the 413 tokens satisfying a series of timing eligibility criteria described in Appendix 1. NeoTokyo Citizen token omitted because it would required significantly compressing the scale.

- (b) The two similar tokens to MetaBirkins with respect to average sale price do not appear to share other similarities. At the time of minting, one founder of NeoTokyo Citizen had some 1.1 million YouTube subscribers<sup>64</sup> and 500,000 Twitter followers<sup>65</sup>; the other had roughly 560,000 YouTube subscribers<sup>66</sup> and 540,000 Twitter followers.<sup>67</sup> NeoTokyo was also announcing \$400,000 video game tournaments on the front page of and in partnership with popular streaming service Twitch.tv within days of launch.<sup>68</sup> Mobland, meanwhile, launched with a fully functional web3 game, and outside investment rounds exceeding \$8 million.<sup>69</sup> MetaBirkins, by contrast, to our knowledge had no announced outside investment and offered no known, tangible benefits at mint (other than the Metabirkin imagery). Rothschild had only a couple previous NFT sales at the time, and even a month after the mint had on the order of 10,000 followers<sup>70</sup>; and the Metabirkins Twitter account had roughly 5,500 followers.<sup>71</sup>

<sup>64</sup><https://socialblade.com/youtube/c/alexbeckerschanel/monthly>

<sup>65</sup><https://socialblade.com/twitter/user/zssbecker/monthly>

<sup>66</sup><https://socialblade.com/youtube/c/fudtv/monthly>

<sup>67</sup><https://socialblade.com/twitter/user/elliortrades/monthly>

<sup>68</sup><https://twitter.com/ZssBecker/status/1466880335170392076>

<sup>69</sup>Mobland. *8millioninvestmentco – ledbytwitchco – founderJustinKanandZyngaChina'sco – founderRobin.... Medium*, Feb. 2022. [medium.com/@MOBLANDHQ/8-million-investment-co-led-by-twitch-co-founder-justin-kan-and-zynga-chinas-co-founder-robin-31c34bdece9d](https://medium.com/@MOBLANDHQ/8-million-investment-co-led-by-twitch-co-founder-justin-kan-and-zynga-chinas-co-founder-robin-31c34bdece9d).

<sup>70</sup><https://socialblade.com/twitter/user/masonrothschild>

<sup>71</sup><https://socialblade.com/twitter/user/metabirkins/monthly>

- (c) One might conjecture that the high average sale price for MetaBirkins was somehow due to the fact that the collection was especially small—comprising only 100 tokens. We can, however, compare the average daily market cap (average sale price multiplied by volume sold) for all tokens through the first 17 days. In terms of market cap, MetaBirkins ranks 51st out of 413 tokens, or in the 87th percentile. However, among the tokens with higher market cap than MetaBirkins, only one has fewer than 500 tokens (Mobland, with token supply of 423) and only three others have 1000 tokens or fewer. Figure 30 shows a histogram of the supply of MetaBirkins and the 50 higher-market cap tokens; As the figure shows, the vast majority of tokens with higher market caps had substantially larger token supplies; many of these were large digital brand NFTs (e.g., Swampverse<sup>72</sup>). Of the 202 collections in our sample with 1000 or fewer tokens (approximately half of all collections analyzed), MetaBirkin ranks 5th in terms of overall market cap, and only the four above it and two others below it are within 40% of MetaBirkins's market cap. (Figure 31 gives a complete picture.)

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<sup>72</sup><https://swamps.io/>

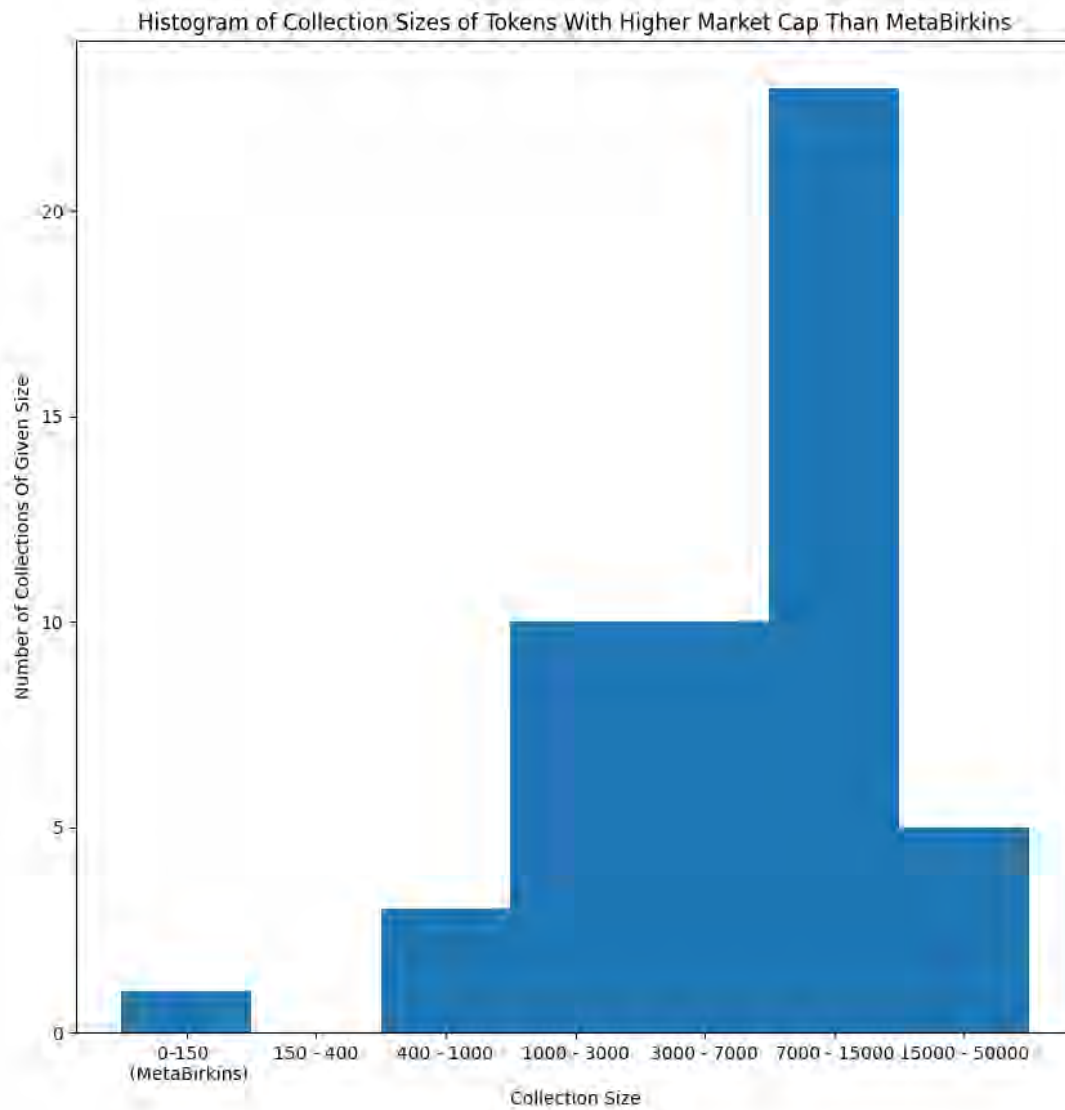


Figure 30: Size comparison of contemporaneous tokens with larger market caps than MetaBirkins.

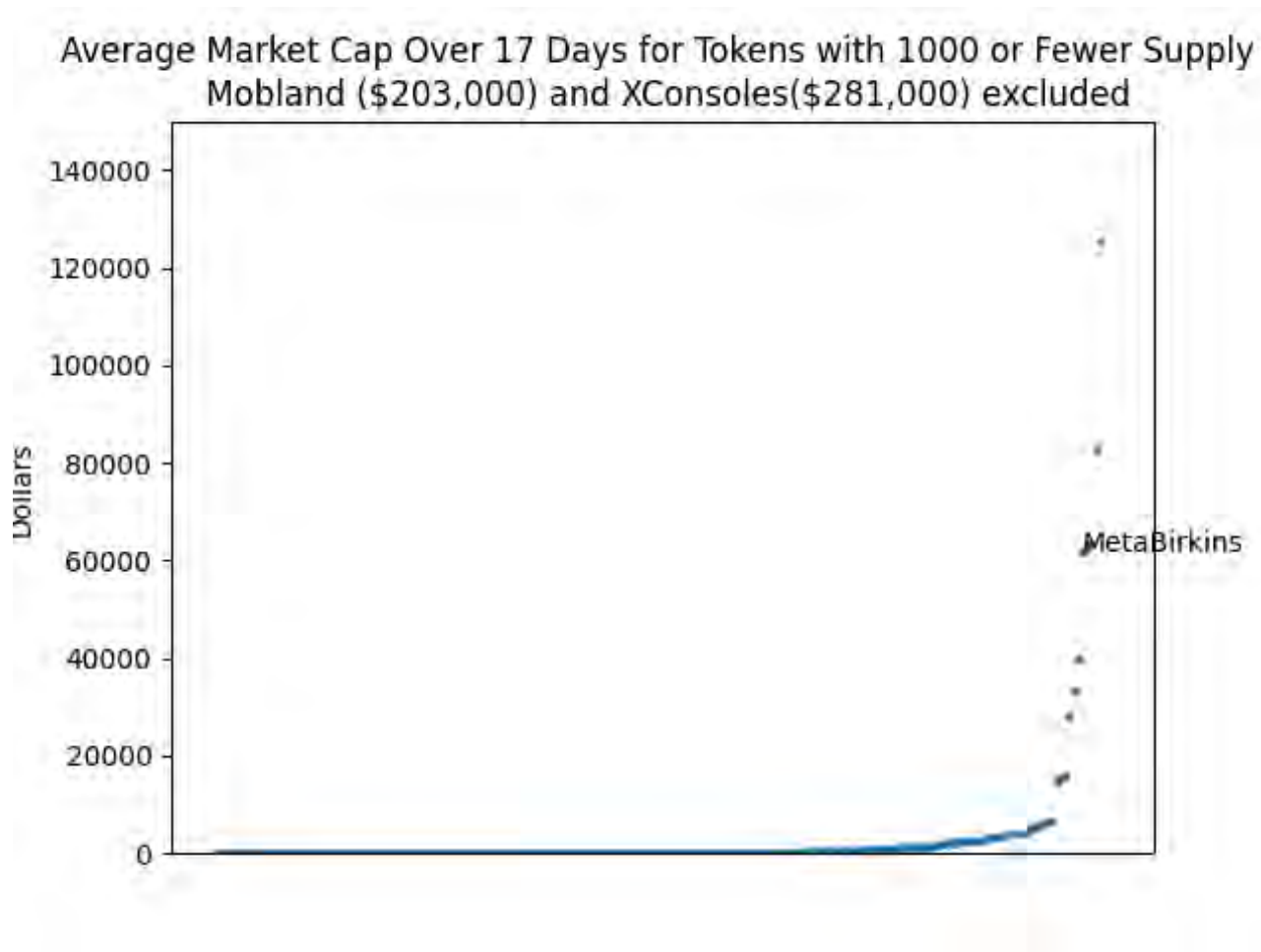


Figure 31: Market caps of MetaBirkins and other contemporaneous tokens with 1000 or fewer total supply, Mobland and XConsoles omitted because they would have required significantly compressing the scale.

- (d) Just as in the case of the rankings by average daily price, the similar tokens with similar size and daily market cap to MetaBirkins otherwise seem fairly dissimilar to MetaBirkins. First, they still have substantially larger collection sizes (400-1000). (Among tokens with less than 400 supply, MetaBirkins has no peers in terms of daily market market cap.) The 400-1000 supply NFTs with greater daily market cap than MetaBirkins are:
- X-consoles (Nint3ndo), a decentralized play-to-earn staking platform backed by twelve partners with significant followings<sup>73</sup>, and which had clear, published whitepapers outlining their goals<sup>74</sup>;
  - Mobland, discussed previously;
  - Landscapes, a “Quantum AI Data Paintings” project in collaboration with Google,<sup>75</sup> by an artist with 500,000 Instagram followers,<sup>76</sup> a Wikipedia page,<sup>77</sup> and a long his-

<sup>73</sup><https://twitter.com/0xConsoles/status/1473158274669334530>

<sup>74</sup><https://docs.xconsoles.tv/x-dao/x-dao/abstract>

<sup>75</sup><https://sd.refikanadol.com/>

<sup>76</sup><https://socialblade.com/instagram/user/refikanadol/monthly>

<sup>77</sup>[https://en.wikipedia.org/wiki/Refik\\_Anadol](https://en.wikipedia.org/wiki/Refik_Anadol)

tory of exhibitions around the world; and

- Subtraction, an art collaboration between two artists with a combined 140,000 Instagram followers<sup>78</sup> and a long history of previous art sales and exhibitions<sup>79</sup>.

A further three projects were within 40% of MetaBirkins's daily market cap. These were:

- Exponentials, a collection that automatically deleted its tokens if they were listed below a price threshold that increased exponentially by day<sup>80</sup>;
- MintDisc3: A redeemable NFT branded by RTFKT, a well-known digital artifact company that would later go on to be acquired by Nike<sup>81</sup>;
- MintDisc1: A different redeemable NFT by RTFKT.<sup>82</sup>

Other than Exponentials, which explicitly used an algorithmic deletion process to drive up price, all the other tokens in the range of MetaBirkins under this metric were part of major projects, run or supported by people with established followings and track records.

- (e) A similar narrative appears if we instead compare projects in the sample according to supply-adjusted price (average daily price multiplied by supply). MetaBirkins is 90th out of the 413 tokens in terms of supply-adjusted price, but 8th out of 202 when only considering tokens with 1000 supply or less, and 2nd when considering tokens with less than 500 supply (with Mobland again being number 1). Importantly, recall MetaBirkins has a supply of only 100. Among the 97 tokens in the sample with less than 400 supply, it ranks 1st, and is more than 5x the second-largest by supply adjusted price, and 9x the third, see Figure 32.

<sup>78</sup><https://socialblade.com/instagram/user/thankyoux/monthly>

<sup>79</sup><https://www.instagram.com/thankyoux/>

<sup>80</sup><https://exponentials.art/>

<sup>81</sup><https://opensea.io/collection/mintdiscthree>

<sup>82</sup><https://opensea.io/collection/mintdiscone>



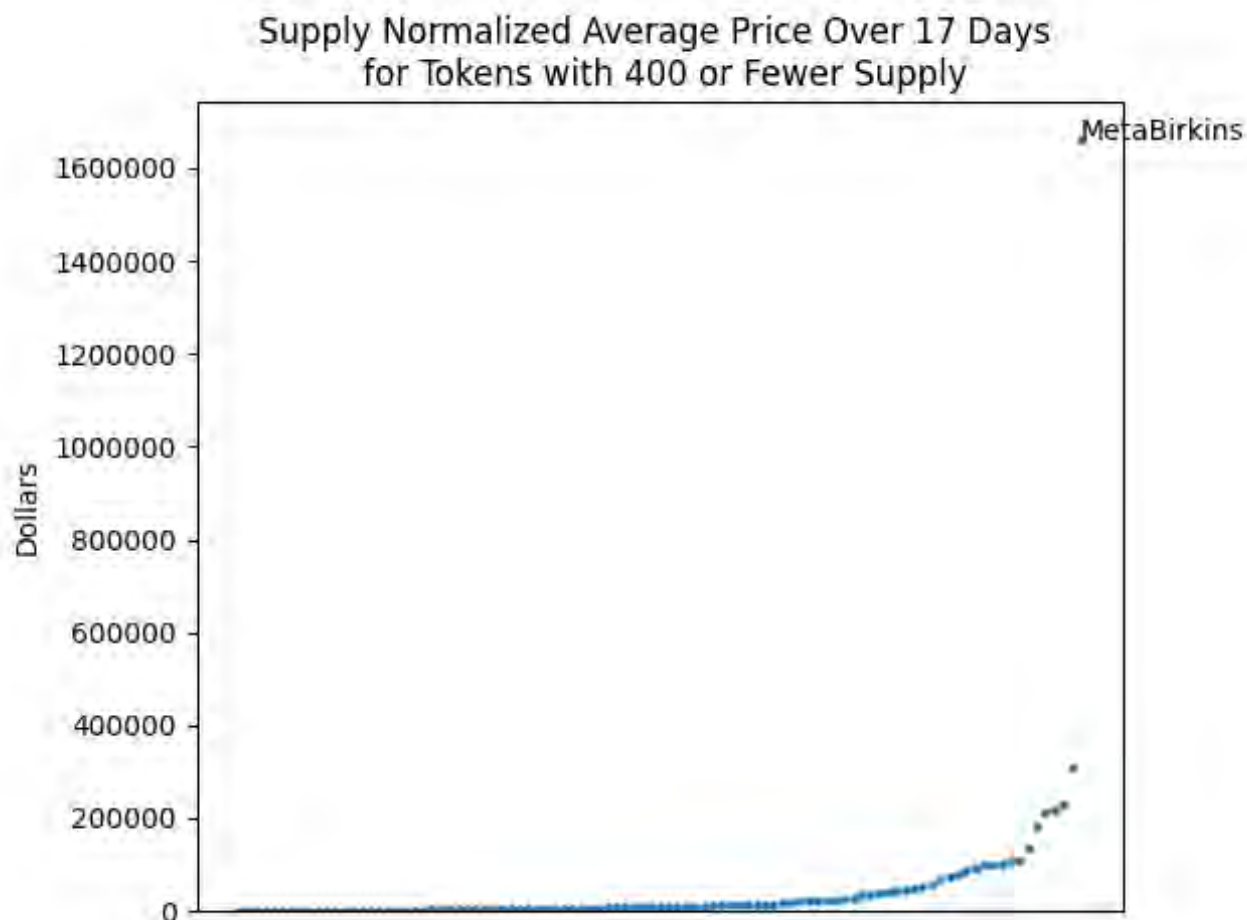


Figure 32: Supply Normalized Adjusted Price of MetaBirkins and other contemporaneous tokens with 400 or fewer total supply.

59. We complemented the analysis just described with two methods that use unsupervised machine learning to group the tokens in our sample with supply less than or equal to 1000 into clusters of similarity based on market cap. Clustering is a ubiquitous technique to find similarities and differences between data points (in this case, we treat the trading behavior of a token over some time frame as a single data point). Clustering works by trying different groupings of the data into “clusters” to maximize the similarity of data within a cluster, and maximize the difference of data between clusters. The method is commonly used in a wide range of fields, including economics, to draw conclusions from data.<sup>83</sup> One clustering method used, self-organizing maps (SOMs), uses competitive learning to cluster data points around some chosen number of centroids; the other, *K*-means clustering, is similar, but uses standard heuristics for clustering instead of competitive learning. (Again, see Appendix 1 for details.)

(a) Our findings from the machine learning analysis are consistent with the findings reported above. The statistics identify MetaBirkins as being in a cluster with NFT collections that are either associated with well-known brands or created by individuals who had significant

<sup>83</sup>Stephen J Brown and William N Goetzmann, “Mutual fund styles”, *Journal of Financial Economics* vol. 43, no. 3, 1997: pp. 373–399.

recognition at the time of the MetaBirkins minting (and sometimes also the Exponentials collection, which used an algorithm to artificially inflate price through token deletion).

- (b) The SOM method identifies four clusters (Figure 33). One of the clusters has 192 tokens, and the other three clusters split only 10 tokens. The cluster containing MetaBirkins, cluster 1, contains the following other collections: A Reebok branded collaboration, the Exponentials collection, and Soulware, a music project that had, among others, the backings of Mister V, a rapper with a Wikipedia page, more than 4.5 million Instagram followers, and more than 6 million Twitter followers.<sup>84</sup>

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<sup>84</sup>Note that while Soulware had significant attention and backing at launch, the project eventually failed, as described by the founder Outsider.

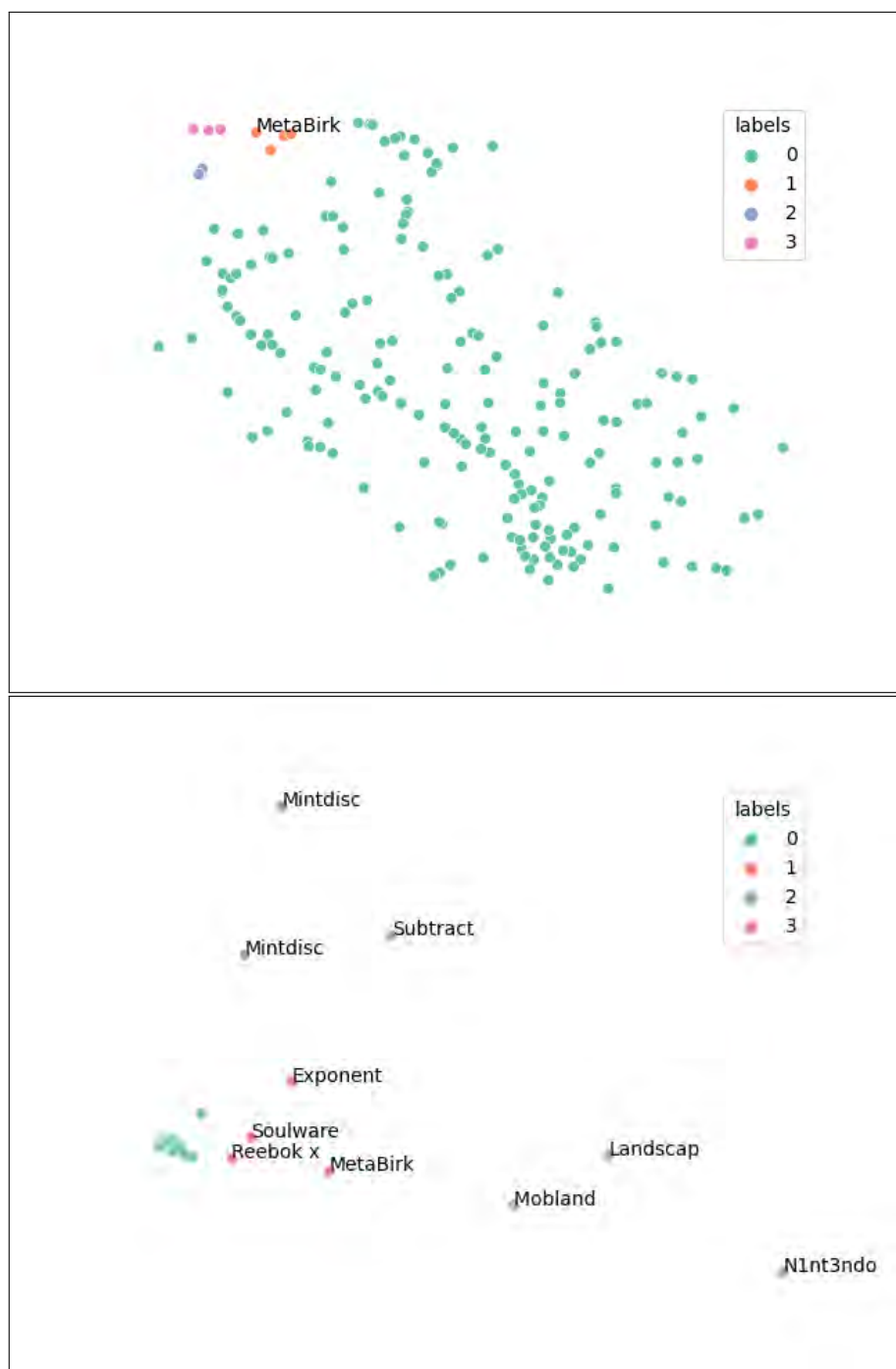


Figure 33: Resulting Clusters from using SOM to cluster tokens with 1000 or less supply based on market cap and displayed using TSNE (top) and PCA (bottom).

- (c) The  $K$ -means method produces similar results (Figure 34). Of the 6 clusters for tokens with supply less than or equal to 1000, the clusters have sizes 194, 4, 3, 1, 1 and 1. MetaBirkin's cluster is identical to its cluster under SOM analysis.

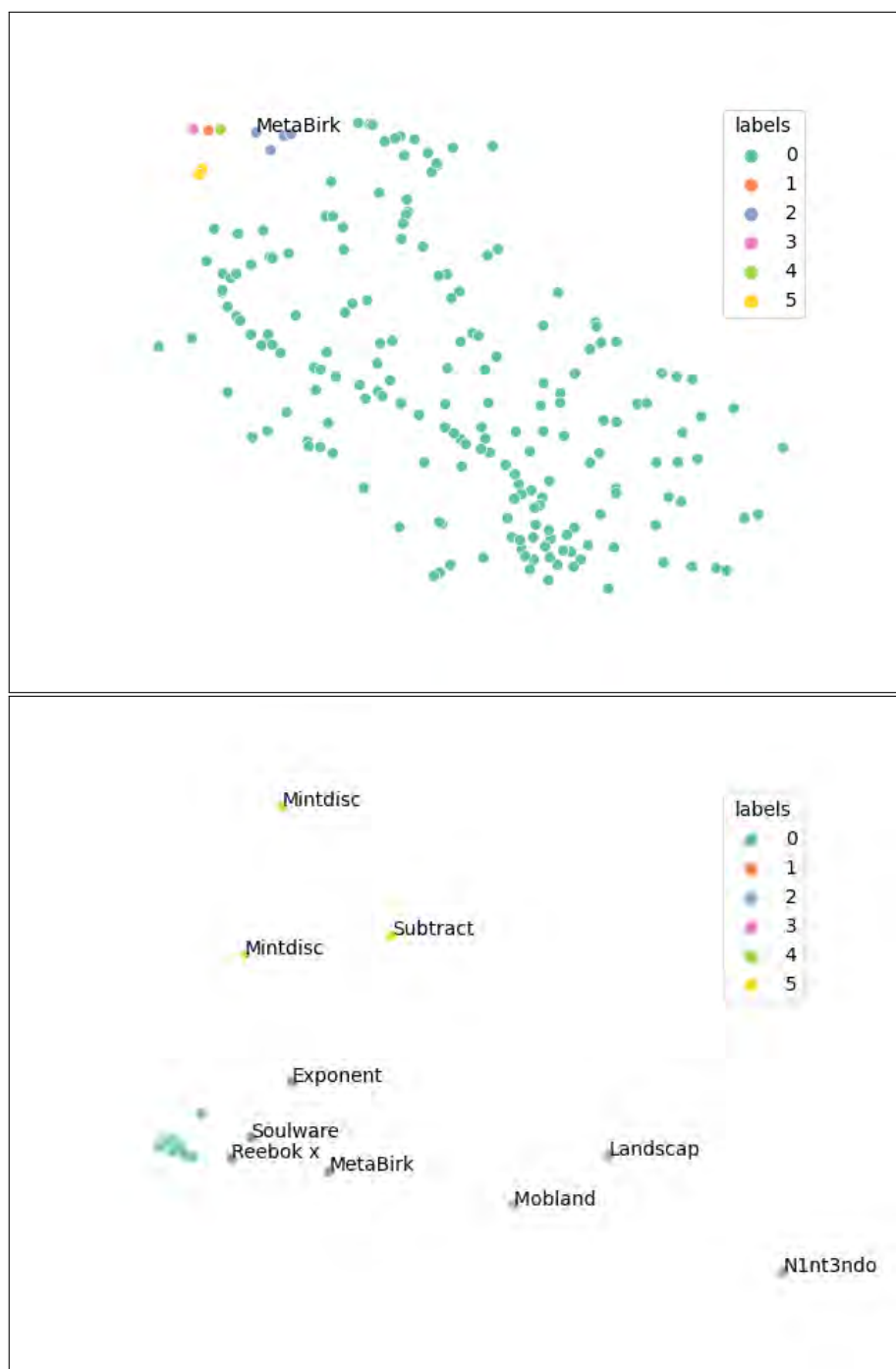


Figure 34: Resulting Clusters from using Kmeans to cluster tokens with 1000 or less supply based on market cap and displayed using TSNE (top) and PCA (bottom).

## The Role of the Hermès Association and Brand Assets in the MetaBirkins Project

60. The empirical analysis above shows that the MetaBirkin NFTs were in price and trading categories commensurate with NFTs either (1) associated to established brands; (2) involving well

established communities, and often upfront investment such as game design; or (3) with creators with followings much larger than Rothschild appears to have had at the time. To my knowledge, the MetaBirkins project did not have any of those features, except inasmuch as the “MetaBirkin” name and use of the Hermès marks indirectly linked MetaBirkins to the Hermès brand.

61. Moreover, to the extent the Rothschild was building a digital brand around the MetaBirkins, the “Birkin” handbag name, style, and Hermès association appear to have been core components of that brand from the outset.
  - (a) The earliest public mention of the project details I am aware of was Rothschild’s October 28, 2021 Tweet, which referred to the collection as “Birkins of varying rarity” (Figure 35).

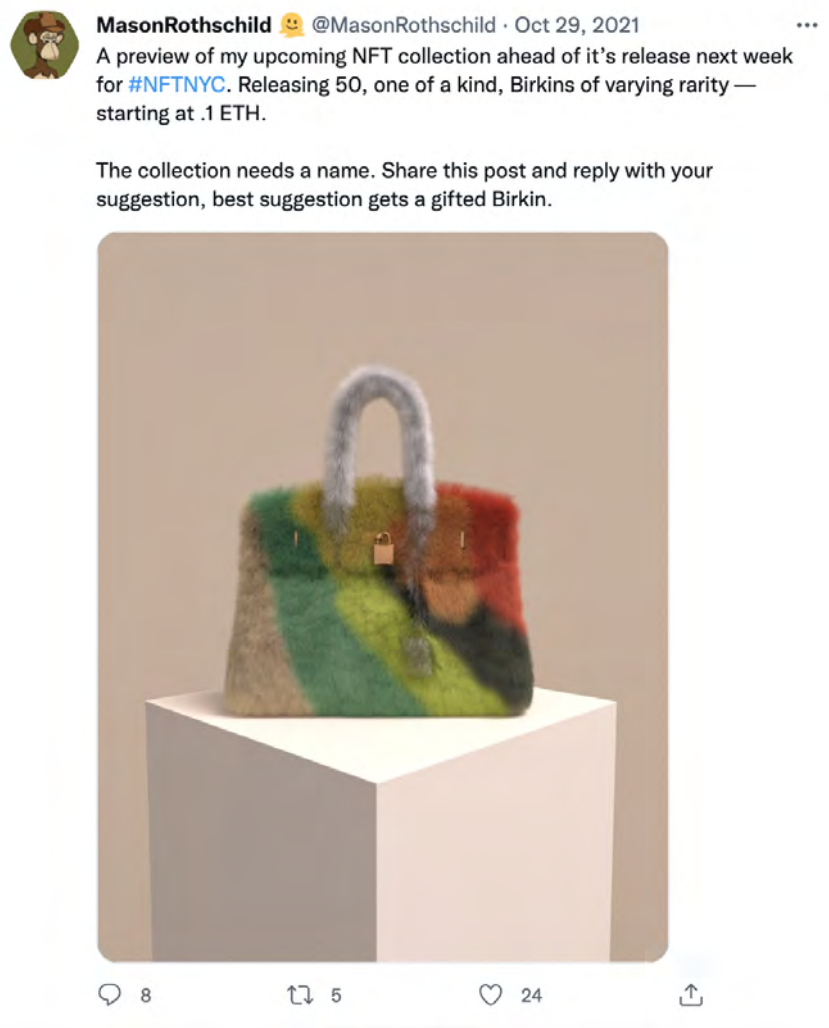


Figure 35: The first Tweet we are aware of detailing the project, which referred to the collection as “Birkins of varying rarity.”

- (b) And again, the horse charm airdrop Rothschild teased was explicitly based around an Hermès brand asset, as shown in Figure 36. In digital brand NFTs, as mentioned above,



secondary NFT airdrops in the digital brand submarket are typically intended to reinforce the main brand identity. The choice to use another Hermès brand asset (rather than even, say, an asset from a different well-known fashion brand) is consistent with how other NFT projects maintain brand consistency as they expand their ecosystems, and would seem to further reinforce the importance of the Hermès connection, *per se*, as being core to the brand identity of the MetaBirkins. At minimum, the suggested airdrop would likely have led prospective collectors to expect that if they chose to purchase a MetaBirkin, they would receive at least one further Hermès-styled NFT asset in the future (the horse charm).



Figure 36: Left: Horse Charm Airdrop teased by Rothschild. Right: Real Horse Charm sold by Hermès.

- (c) At least some MetaBirkin enthusiasts specifically highlighted the luxury implied by the Hermès connection in contributing to their enthusiasm for the MetaBirkins brand (see, e.g., Figure 37).

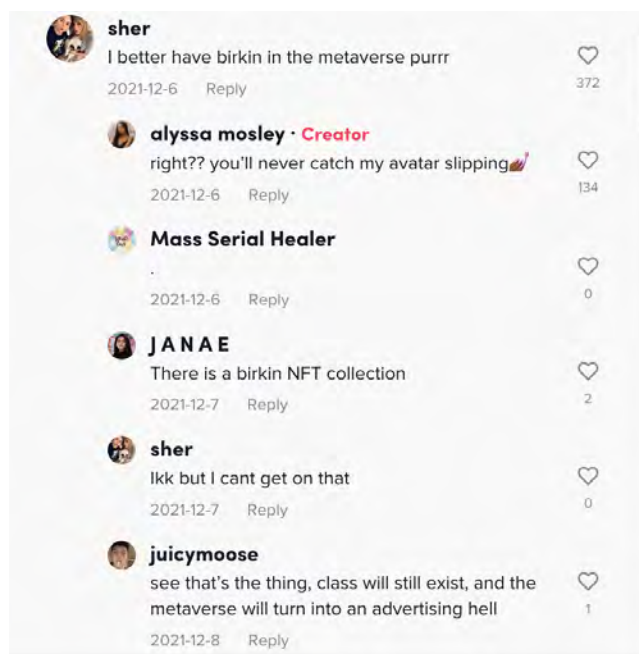


Figure 37: Comments from TikTok video [https://www.tiktok.com/@alyssamosley\\_/video/7038626918119247150](https://www.tiktok.com/@alyssamosley_/video/7038626918119247150) discussing MetaBirkins.

62. The public advertising, media, and social media engagement around the MetaBirkins also made direct reference and comparison to Hermès. Given that social media algorithms actively promote popular and trending topics, that likely would have driven increased general social media attention to the project, and may also have boosted the extent to which platform algorithms promoted information about the MetaBirkins.
63. In sum, it is my opinion that the use of the Hermès brand and marks contributed to defining the MetaBirkin product and brand, and moreover contributed to the public attention around the project both before and especially after the lawsuit. In the context of the NFT market, both connection to a well-established brand and significant market attention would be seen as signifiers of value along multiple dimensions such as ownership and identity (through connection to a scarce “luxury” item) as well as investment value (with increased attention to creating the potential of increased future buyer demand). Additionally, the Hermès brand assets played into one of the mechanisms by which Rothschild suggested he would provide direct utility to MetaBirkin holders through a follow-up airdrop. To the extent that the MetaBirkins’s prices and trading patterns were outside the empirical range of otherwise similarly situated projects—and instead similar to large-scale projects, some of which were associated to established brands—the Hermès association is the most likely explanation for that based on my analysis.

Dated: August 5, 2022

Scott Duke Kominers

# Appendices

## 1 Empirical Methodology Details

The following is a high-level overview of the methods employed in the empirical analysis.

All ERC-721 tokens whose minting occurred around the time of the MetaBirkins token minting and that were available from the Icy Tools API were scraped using that API. “Around the time of” is defined according to the following two tests:

- At least one token in the collection was minted in the temporal range between [22 November 2021 – 9 December 2021). These dates were chosen to span approximately a week on either side of the minting of the MetaBirkins.<sup>85</sup>
- No tokens in the collection were bought or sold in the week prior to the sample period, that is, between [15 November 2021 – 22 November 2021).

A total of 415 collections were found to satisfy this criteria. For the analysis, a further two were not considered:

- Nouns — This project is unique in that it has a constant ongoing minting process (one per day) and very low trade volume. While Nouns satisfies the above test, but is not considered a project that began minting around the same time of MetaBirkins.
- cMyGraves (0x5d257d7fda05a768823e305d0e54fc823537cde4) — This project has had precisely three sales in the Icy Tools data, two for less than a penny, and one for approximately \$135,000. Because of the clear irregularity, it was excluded.

Only the first 17 days of trading post mint were considered for analysis of these collections because the MetaBirkins collection, after 17 days, saw only one additional trade on the OpenSea platform (43 days after the mint) due to OpenSea removing the MetaBirkins from their platform (we are unsure why one trade seemingly happened significantly after removal from the platform). Thus, for consistency, we consider only the first 17 days of trading of all tokens in the sample.

All sales for NFTs were converted from Ethereum to USD using the market closing conversion rate on the day the sale was made. Closing conversion rate was used for to consistency with the expert report of Dr. Kevin D. Mentzer.

For each of the 413 tokens in the analysis, the following statistics were gathered from Icy Tools:

- Daily Average Price—The average price of all sales that occurred for that NFT on that day;
- Daily Floor Price—The lowest price for which an NFT in the collection was sold on that day;
- Daily Volume—The absolute quantity of NFTs in the collection that were sold on that day;
- Supply—The absolute quantity of NFTs in the collection that have been minted as of 10 July 2022.

In addition, the following statistics were calculated for the analysis:

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<sup>85</sup>Other dates were not attempted or analyzed for how they would affect the found collections.

- Daily Market Cap—This is the Daily Average Price multiplied by the Daily Volume on that day;
- Supply Normal Price—This is the Daily Average Price multiplied by the Supply of the token.

In addition to the simple ranking exercise described in the main text of the report, two machine learning methods commonly used for clustering of non-parametric data were employed: Self Organizing Maps (SOMs) and  $K$ -means clustering (using Euclidean distance as the distance metric). The implementation of SOM used was <https://github.com/JustGlowing/minisom> and the implementation of  $K$ -means used was Sklearn's standard implementation.

$K$ -means clustering is very simple. We (pseudo-)randomly initialize  $K$  centers, and then group the points based on their nearest center. We then change the  $K$  centers to be the centers of the created groups, and repeat the process. Because the centers are now different, points may change groups, after which the centers will again change. We continue repeating this process until points do not change groups between iterations, and thus the centers are fixed.

One of the key decisions in  $K$ -means clustering is the choice of distance metric. For time series data, there exist two generally standard methods: Euclidean and Dynamic Time Warping (DTW). DTW is generally based on the shape of the sequence, and assumes that compared sequences may be shifted. In this data analysis, we do not have shifted data, as we consider only the first 17 days of trading for each token. We also care about absolute value, i.e., the value of the trades that occurred. For these reasons, as discussed in Izakian, Hesam, Witold Pedrycz, and Jamal, "Fuzzy clustering of time series data using dynamic time warping distance," *Engineering Applications of Artificial Intelligence* vol. 39, 2015: 235–244, we choose to use Euclidean distance.

SOMs are another way to cluster, that involve modifying weight vectors by exposing them to a data point, picking a "winning" vector that best represents the data point, and then updating that vector and vectors near it, where "near" is defined by the neighborhood function. After repeatedly doing this many times, we obtain specific vectors that best represent these points and are then used to create the clusters.

Hyperparameters for the machine learning methods were chosen using standard methodology including minimizing error rates and looking for convergence. Cluster sizes were chosen using both the standard Silhouette and Elbow methods. The following hyperparameters were used:

- Random Seed: 808795796
- SOM
  - Clusters: 4
  - Sigma: .875
  - Learning Rate: .7
  - Training Iterations: 65,000
  - Neighbor Function: Gaussian
- $K$ -means
  - Clusters: 6
  - Metric: Euclidean

With regard to graphically displaying the results of the clustering, we use two very standard methods of dimensionality reduction, Principal Component Analysis (PCA) and t-Distributed Stochastic Neighbor Embedding (TSNE).



## 2 Methodology for Figure 11

To create Figure 11, we did the following:

1. Identified all artists who had sold at least one piece on the Gucci Vault.<sup>86</sup>
2. Excluded three artists:
  - (a) Drew Young — An artist who has not made a non-Gucci Vault NFT sale that we were able to identify.
  - (b) Anchenillustration — An illustrator who also has not made a non-Gucci Vault NFT sale that we were able to identify.
  - (c) Merijn & Jurriaan Hos — Two people working in tandem.
3. For the remaining artists, identified the highest price paid for a piece of theirs on the Gucci vault in ETH and converted it to USD, and identified their highest non-Gucci Vault NFT sale in ETH and converted it to USD.
  - (a) This was done by looking for all listed aliases of the artist, and then searching for them on the biggest standard marketplaces (OpenSea, Superare), as well as a few smaller marketplaces. All the artists were found to be sufficiently prominent these various platforms that we have confidence that it is unlikely we missed even higher-value sales.
4. “Factor” was calculated by dividing an artist’s highest sale in USD on Gucci Vault by their highest outside sale in USD.

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<sup>86</sup><https://vaultartspace.gucci.com/>

### **3 Kominers's CV**

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## HARVARD | BUSINESS | SCHOOL

August 5, 2022

### Scott Duke Kominers

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### EDUCATION

- 2011 Ph.D., Business Economics, Harvard University, Cambridge, Massachusetts  
Dissertation: “Matching Models of Markets.”  
Advisors: Alvin E. Roth (chair), Susan Athey, Drew Fudenberg, John William Hatfield, Andrei Shleifer, and E. Glen Weyl.
- 2010 A.M., Business Economics, Harvard University, Cambridge, Massachusetts
- 2009 A.B., *summa cum laude*, Mathematics, Harvard University, Cambridge, Massachusetts  
Minor: Ethnomusicology.  
Thesis: “Weighted Generating Functions and Configuration Results for Type II Lattices and Codes.”  
Advisor: Noam D. Elkies.

### TEACHING EXPERIENCE

#### HARVARD UNIVERSITY

##### Appointments

- 2022 – present Professor, Entrepreneurial Management Unit
- 2017 – present Faculty Affiliate, Department of Economics
- 2015 – present Affiliate, Center of Mathematical Sciences and Applications
- 2020 – present Faculty Affiliate, Harvard Data Science Initiative
- 2017 – 2022 MBA Class of 1960 Associate Professor, Entrepreneurial Management Unit
- 2013 – 2017 Associate, Center for Research on Computation and Society
- 2013 – 2017 Junior Fellow, Society of Fellows
- 2016 Lecturer, Entrepreneurial Management Unit
- 2015 Visiting Lecturer, Department of Economics

## **Assignments**

- 2018 – present Making Markets (MBA Elective Curriculum), Harvard Business School, Spring
- 2017 – present Guest Lecturer: Launching New Ventures/Leading Growing Ventures, Endeavor, Entrepreneurs' Organization (Executive Education), Harvard Business School, Fall/Spring
- 2015 – present Market Design (Doctoral Course), Harvard University, Fall/Spring
- 2016 The Entrepreneurial Manager (MBA Required Curriculum), Harvard Business School, Spring

## **UNIVERSITY OF CHICAGO**

### **Appointments**

- 2011 – 2013 Saieh Family Fellow in Economics, Becker Friedman Institute
- 2011 – 2013 Instructor, Department of Economics

### **Assignments**

- 2016 – 2017 Market Design Perspectives on Inequality (Graduate Mini-Course), Chicago Summer School on Socioeconomic Inequality, Summer
- 2012 – 2015 Market Design Approaches to Inequality (Graduate Mini-Course), Chicago Summer School on Socioeconomic Inequality, Summer
- 2012 – 2013 Topics in Matching and Market Design (Doctoral Course), Department of Economics, University of Chicago, Spring 2013; Winter 2012
- 2013 Market Design Approaches to Inequality (Graduate Mini-Course), Beijing Summer School on Socioeconomic Inequality, Summer

## **AFFILIATIONS**

- 2022 – present Research Partner, a16z crypto
- 2016 – 2022 Columnist, *Bloomberg Opinion*
- 2015 – 2021 Research Economist, National Bureau of Economic Research
- 2018 – 2019 Eminent Research Visitor, University of Melbourne
- 2016 Visiting Fellow, Oxford Martin School
- 2013 – 2016 Research Scientist, Program for Evolutionary Dynamics, Harvard University
- 2014 – 2015 Visiting Researcher, Microsoft Research New England

## **WORK EXPERIENCE**

- 2010 Social Science Analyst, Economic Analysis Group, US Department of Justice, Washington, DC
- 2007 – 2009 Research Assistant to Susan Athey, Edward L. Glaeser, William Kerr, and Andrei Shleifer, Harvard University, Cambridge, MA
- 2007 Operations Research Engineering Intern, Google, Mountain View, CA

**GRANTS AND FELLOWSHIPS**

- 2021 – present Sloan Foundation Grant to Support Mathematical Sciences Research Institute [MSRI] Programs on “Mathematics and Computer Science of Market and Mechanism Design” and “Algorithmic Fairness” (\$600,000; with Hélène Barcelo, Alaina Moore, and the rest of the MSRI Team.)
- 2019 – present Washington Center for Equitable Growth Grant: “Market Design Responses to Inequality” (\$29,400; with Mohammad Akbarpour, Piotr Dworczak, and Ravi Jagadeesan)
- 2015 – 2021 NSF Social and Economic Sciences [SES] Grant: “Preferences in Matching Market Design” (\$220,761)
- 2015 – 2021 NSF Science of Science and Innovation Policy [SciSIP] Grant: “Assessing the Impact of Non-Practicing Entities on U.S. Innovation” (\$385,502; with Lauren Cohen and Umit G. Gurun)
- 2019 – 2020 Sloan Foundation Conference Grant: “Conference on Big Data” (\$20,000; with Shing-Tung Yau, Richard Freeman, Jun Liu, Nikhil Naik, and Horng-Tzer Yau)
- 2018 – 2019 University of Melbourne Eminent Research Scholar Grant
- 2017 Sloan Foundation Conference Grant: “Conference on Big Data” (\$20,000; with Shing-Tung Yau, Richard Freeman, Jun Liu, Nikhil Naik, and Horng-Tzer Yau)
- 2016 – 2017 Star Family Challenge for Promising Scientific Research Grant: “Computer Vision-Automated Surveys for Urban Science and Economic Development” (\$97,000; with Edward L. Glaeser, Rema Hanna, Benjamin Olken, and Nikhil Naik)
- 2016 – 2017 Radcliffe Exploratory Seminar Grant: “Predictive Cities: Leveraging New Data and Methods to Improve Urban Quality of Life” (~\$18,000; with Edward L. Glaeser, Michael Luca, and Mitchell B. Weiss).
- 2016 – 2017 Sloan Foundation Conference Grant: “Conference on Big Data” (\$20,000; with Shing-Tung Yau, Richard Freeman, Jun Liu, Christopher Rogan, and Horng-Tzer Yau)
- 2016 Oxford Martin School Visiting Fellowship
- 2015 – 2016 International Growth Centre [IGC] Small Projects Grant (£6,900; with Edward L. Glaeser, Rema Hanna, Benjamin Olken, and Nikhil Naik)
- 2012 – 2016 NSF Interface between Computer Science and Economics & Social Sciences [ICES] Grant: “Understanding the Roles of Intermediaries in Matching Markets” (\$398,927; with Eric Budish, Ali Hortaçsu, and Nicole Immorlica).
- 2014 – 2015 William F. Milton Fund Grant (\$39,994)
- 2015 Econometric Society Travel Grant
- 2011 – 2014 AMS–Simons Travel Grant
- 2012 – 2013 Human Capital and Economic Opportunity/Institute for New Economic Thinking Research Grant (with Jay Garlapati)
- 2009 – 2011 NSF Graduate Research Fellowship
- 2010 – 2011 Terence M. Considine Fellowship in Law and Economics.
- 2010 – 2011 Yahoo! Key Scientific Challenges Program Fellowship
- 2009 – 2011 Harvard Real Estate Academic Initiative Faculty Grant (with E. Glen Weyl)
- 2010 Harvard Institute for Quantitative Social Science Travel Grant



2010	Danielan Fund Research and Travel Grant
2009	National Defense Science and Engineering Graduate Fellowship (declined)
2008	Harvard Institute for Quantitative Social Science Summer Scholars Program Fellowship
2008	Harvard College Program for Research in Science and Engineering Fellowship
2008	Harvard Mathematics Department Highbridge Fellowship
2006	Harvard College Program for Research in Science and Engineering Fellowship
2004	Center for Excellence in Education Research Science Institute Summer Scholarship

## AWARDS AND HONORS

2018	Best <i>Economic Inquiry</i> Article Award (with Edward L. Glaeser, Michael Luca, and Nikhil Naik)
2018	Webby Award (“Best Use of Machine Learning” category; with Nikhil Naik, Ramesh Raskar, Edward L. Glaeser, and César A. Hidalgo)
2016	Star Family Prize for Excellence in Advising
2016	Derek Bok Center Certificate of Distinction in Teaching
2015	Kavli Frontiers of Science Fellow
2015	Case Centre Award (“Knowledge, Information and Communication Systems Management” category; with Benjamin Edelman)
2013	Nominee, John R. Marquand Award for Exceptional Advising and Counseling
2013	Center for Excellence in Education Alumni Award for Outstanding Achievement in STEM and Business
2011	Third Place, Romanian Institute of Science and Technology “Best PhD Thesis in Computational Game Theory” Competition
2010	Yahoo! Key Scientific Challenges Program Selectee
2010	St. Mark’s Institute of Mathematics Great Math Challenge Award (with Paul M. Kominers)
2010	AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student
2009	George Caspar Homans Prize
2009	Thomas Temple Hoopes Prize
2009	Phi Beta Kappa
2008	First Place, Robert Fletcher Rogers Prize
2007 – 2008	John Harvard Scholarship
2005	First Place, American Mathematical Society Karl Menger Prize
2005	Second Place, Mathematics Category, Intel International Science and Engineering Fair
2004	California Institute of Technology Signature Award in Mathematics

## PUBLICATIONS

### Full-Length Refereed Journal Articles

- Mohammad Akbarpour ® Eric Budish ® Piotr Dworczak ® Scott Duke Kominers. “An Economic Framework for Vaccine Allocation.” Accepted conditional upon revision, *Quarterly Journal of Economics*. (The “®” symbol indicates that the authors’ names are in certified random order.)
- Piotr Dworczak ® Scott Duke Kominers ® Mohammad Akbarpour. “Redistribution through Markets.” *Econometrica*, 89:4 (2021), pp. 1665–1698. (The “®” symbol indicates that the authors’ names are in certified random order.)
- John William Hatfield, Scott Duke Kominers, and Alexander Westkamp. “Stability, Strategy-Proofness, and Cumulative Offer Mechanisms.” *Review of Economic Studies*, 88:3 (2021), 1457–1502.
- Juan Camilo Castillo, Amrita Ahuja, Susan Athey, Arthur Baker, Eric Budish, Tasneem Chipty, Rachel Glennerster, Scott Duke Kominers, Michael Kremer, Jean Nahrae Lee, Canice Prendergast, Christopher Snyder, Alex Tabarrok, Brandon Tan, and Witold Więcek. “Market Design to Accelerate COVID-19 Vaccine Supply.” *Science*, 371:6534 (2021), 1107–1109.
- John William Hatfield, Scott Duke Kominers, Alexandru Nichifor, Michael Ostrovsky, and Alexander Westkamp. “Chain Stability in Trading Networks.” *Theoretical Economics*, 16:1 (2021), 197–234.
- Arnaud Dupuy, Alfred Galichon, Sonia Jaffe, and Scott Duke Kominers. “Taxation in Matching Markets.” *International Economic Review*, 61:4 (2020), 1591–1634.
- John William Hatfield, Scott Duke Kominers, Richard Lowery, and Jordan M. Barry. “Collusion in Markets with Syndication.” *Journal of Political Economy*, 128:10 (2020), 3779–3819.
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## **WORKING PAPERS (SELECTED)**

Mohammad Akbarpour ® Piotr Dworzak ® Scott Duke Kominers. “Redistributive Allocation Mechanisms.” Revision requested, *Journal of Political Economy*. (The “®” symbol indicates that the authors’ names are in certified random order.)

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John William Hatfield and Scott Duke Kominers. “Hidden Substitutes.”

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Jordan M. Barry, John William Hatfield, Scott Duke Kominers, and Richard Lowery. “Not from Concentrate: Collusion in Collaborative Industries.”

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Scott Duke Kominers. “Respect for Improvements and Comparative Statics in Matching Markets.”

Louis Kaplow and Scott Duke Kominers. “On the Representativeness of Voter Turnout.”

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## **PRESENTATIONS**

### **Research Lectures**

#### **“An Economic framework for Vaccine Allocation”**

ACM Conference on Economics and Computation (July 14, 2022); Sixth Marketplace Innovation Workshop (May, 2022); “COVID-19” Session, Conference on Equity and Access in Algorithms, Mechanisms, and Optimization (October 7, 2021).

#### **“Redistributive Allocation Mechanisms”**

Crypto Research Seminar, a16z crypto (July 7, 2022); Department Seminar, University of Bristol School of Economics (May 25, 2022); Frontiers in Economics 4 Ukraine Seminar, Kyiv School of Economics (May 18, 2022); “Economic Theory” Session, Royal Economic Society Conference (April 13, 2022); “New Directions in Mechanism Design” Session, American Economic Association Meetings (January 9, 2022); “Mechanism Design and Markets” Session, EEA-ESEM Virtual Congress (August 26, 2021); Marketplace Innovation Workshop (May 25, 2021).

#### **“Digital Assets and Market Design”**

MIT IDE Lunch Seminar Series (April 21, 2022).

#### **“Developing a Large-Scale, Well-Structured, and Multi-Domain Corpus of Patent Applications”**

Fenrir, LLC Data Science Seminar (August 25, 2021).

#### **“Respect for Improvements and Comparative Statics in Matching Markets”**

Sixth World Congress of the Game Theory Society [GAMES2021] (July 23, 2021); AMS Session on “Operations Research, Mathematical Programming, Optimization, Game Theory, Economics, and Mathematics in the Social and Behavioral Sciences,” Joint Mathematics Meetings (January 18, 2019).

#### **“Collusion in Brokered Markets”**

Sixth World Congress of the Game Theory Society [GAMES2021] (July 23, 2021).

#### **“Investment Incentives in Near-Optimal Mechanisms”**

22nd ACM Conference on Economics and Computation [EC’21] (July 21, 2021); 47th Annual Conference of the European Association for Research in Industrial Economics [EARIE] (August 28, 2020).

#### **“To Infinity and Beyond: Scaling Economic Theories via Logical Compactness”**

Australasian Meeting of the Econometric Society (July 7, 2021); University of Michigan Economic Theory Seminar (April 16, 2021); North Carolina State University Microeconomic Theory Seminar (April 14, 2021); Israel Algorithmic Game Theory Seminar (January 19, 2020); Harvard/MIT Economic Theory Workshop (November 5, 2020); Harvard Center of Mathematical Sciences and Applications Colloquium (February 12, 2020); NSF/NBER/CEME Mathematical Economics Conference (October 25, 2019); Stony Brook Workshop on Simplicity and Robustness in Complex Markets (July 11, 2019).

#### **“Redistribution through Markets”**

AlixPartners Economics Academic Speaker Series (June 24, 2021); New Zealand Economics eSeminar (May 12/13, 2021); University of Tokyo Market Design Center International Workshop in Market Design (March 24/25, 2021); Equitable Growth Grantee Conference (December 7, 2020); Max Planck Institute for Research on Collective Goods (November 23, 2020); Conference on Mechanism and Institution Design (June 12, 2020); TGS Management Company Seminar (May 29,

2020); Marist College School of Management Research Seminar (May 6, 2020); Inter-Institutional Virtual Market Design Seminar (April 20, 2020); California Institute of Technology Economic Theory Seminar (April 15, 2020); “Matching under Inequality: Implications for Policy” session, AEA Meetings (January 4, 2020); Invited Talk, 30th Stony Brook International Conference on Game Theory (July 15, 2019); Third Workshop on Mechanism Design for Social Good [MD4SG] (June 28, 2019); KU Leuven Economics Seminar (April 23, 2019); Harvard School of Engineering and Applied Sciences Widely Applied Mathematics Seminar (April 11, 2019); MIT Media Lab (April 10, 2019); University of San Diego Law and Finance Seminar (March 15, 2019); Microeconomics Workshop, Center for Research and Education in Program Evaluation [CREPE], University of Tokyo (December 18, 2018); Invited Talk, Asia-Pacific Industrial Organization Conference (December 15, 2018); Harvard University Public Finance Seminar (November 12, 2018); Carnegie Mellon University/University of Pittsburgh Microeconomic Theory Seminar (November 8, 2018); Keynote Talk, Arne Ryde Conference on “Frontiers of Market Design,” Lund University (September 23, 2018); University of Melbourne Economic Theory and Experiments Seminar (August 17, 2018); Boston College Microeconomics Seminar (May 9, 2018); Berkeley University Economic Theory Seminar (April 23, 2018).

“Market Design to Accelerate and Allocate COVID-19 Vaccines”

CME Group-MSRI Prize Virtual Seminar (December 11, 2020); NBER Market Design Working Group Meeting (October 22, 2020).

“A Three-Part Framework for Entrepreneurial Marketplace Design”

SEEK Strategy Lunch (December 10, 2020).

“Markets for Crypto Tokens, and Security under Proof of Stake”

Università Cattolica Economics Seminar (November 12, 2020).

“Computer Vision Uncovers Predictors of Physical Urban Change”

Wolfe Research QES NLP Conference (April 21, 2020); Harvard Center of Mathematical Sciences and Applications Workshop on Foundations of Computational Science (August 30, 2019); Keystone Strategy Seminar (May 10, 2019).

“Collusion in Markets with Syndication”

Asia-Pacific Industrial Organization Conference (December 13, 2019); University of Melbourne Economic Theory and Experiments Seminar (July 26, 2019); Stanford Graduate School of Business Economics Seminar (May 30, 2018); Harvard Law, Economics, and Organizations Workshop (November 20, 2017); Michigan State University Economic Theory Seminar (November 17, 2017); Becker Friedman Institute Fellows’ Seminar, University of Chicago (October 12, 2017); Harvard/MIT Economic Theory Workshop (April 27, 2017).

“Chain Stability in Trading Networks”

19th ACM Conference on Economics and Computation [EC’18] (June 21, 2018).

“Hidden Substitutes”

INFORMS Workshop on Mathematical Optimization in Market Design (June 18, 2018); CIREQ Montreal Microeconomic Theory Conference (November 19, 2016); NBER Market Design Working Group Meeting (October 28, 2016); 16th ACM Conference on Electronic Commerce [EC’15] (June 16, 2015); Yale University Microeconomic Theory Lunch (April 28, 2015).

“Patent Trolls: Evidence from Targeted Firms”

Simon Fraser University Economic Theory Seminar (October 4, 2017); Facebook, Inc. Research

Seminar (October 27, 2016); Robert F. Lanzillotti Public Policy Research Center and University of Florida Conference on The Economics of Innovation (May 20, 2016); Harvard Center of Mathematical Sciences and Applications Social Science Applications Forum (February 29, 2015); United States Patent and Trademark Office Research Seminar (March 17, 2015); MIT Applied Microeconomics Seminar (March 2, 2015); George Washington University Law School and the United States Patent and Trademark Office “Works in Progress Intellectual Property Colloquium [WIPIP]” (February 7, 2015); “Entrepreneurial Finance” session, AFA Meetings (January 4, 2015); Harvard Law, Economics, and Organizations Workshop (November 24, 2014); University of Chicago Booth School of Business Applied Economics Workshop (November 5, 2014); NBER Summer Institute Workshop on Innovation (July 16, 2014).

“Strategy-Proofness, Investment Efficiency, and Marginal Returns: An Equivalence”

University of Melbourne Economic Theory and Experiments Seminar (April 7, 2017); Pennsylvania State University Micro Theory Seminar (March 31, 2017); University of Cologne Research Seminar of the DFG-Research Unit Design and Behavior (May 31, 2016); University of Texas at Austin Economic Theory Workshop (April 29, 2016); Nuffield College Economic Theory Lunchtime Workshop (January 19, 2016); Harvard/MIT Economic Theory Workshop (December 10, 2015); Brown University Economic Theory Seminar (November 16, 2015); Helsinki Center of Economic Research [HECER] Department Seminar (October 9, 2015); World Congress of the Econometric Society (August 21, 2015); Invited Talk, Meeting of COST Action IC1205 on Computational Social Choice (April 14, 2015); Becker Friedman Institute Celebration of the Life and Work of Gary S. Becker (October 30, 2014); 12th Meeting of the Society for Social Choice and Welfare (June 18, 2014); 15th ACM Conference on Electronic Commerce [EC’14] (June 12, 2014); University of Chicago Special Workshop (January 24, 2014); “Frontiers of Market Design” session, AEA Meetings (January 5, 2014); Stanford University Game Theory and Computation Seminar (October 24, 2013).

“Titling in Informal Settlements”

“Market Design and Development Economics” session, AEA Meetings (January 6, 2017).

“‘Troll’ Check: A Proposal for Administrative Review of Patent Litigation”

“Market Design: Theory and Practice” session, AEA Meetings (January 6, 2017).

“Crowdsourcing City Government: Using Tournaments to Improve Inspection Accuracy”

“Predictive Cities” session, AEA Meetings (January 5, 2016).

“Full Substitutability”

“Advances in Matching Theory” session, AEA Meetings (January 4, 2016); NBER Market Design Working Group Meeting (October 23, 2015); 16th ACM Conference on Electronic Commerce [EC’15] (June 16, 2015); 3rd International Workshop on Matching Under Preferences [MATCH-UP] (April 16, 2015).

“The Coase Theorem and Voluntary Transaction Costs”

Amsterdam Center for Law & Economics Seminar (October 20, 2014); Centre de Recherches en Economie et Droit Seminar (October 16, 2014).

“Stability and Competitive Equilibrium in Trading Networks”

University of Pennsylvania Computer Science Theory Seminar (April 25, 2014); Stanford Graduate School of Business Economics Seminar (October 19, 2011); University of Wisconsin–Madison Economic Theory Workshop (September 30, 2011); Milton Friedman Institute “Matching and Price Theory” conference (May 6, 2011); “Frontiers of Matching Theory” session, AEA Meetings (January 7, 2011).



“Matching Markets with Taxation of Transfers”

Sciences Po “Taxation and Matching” workshop (March 21, 2014).

“The Demise of Walk Zones in Boston: Priorities vs. Precedence in School Choice”

Cornell University Joint Microeconomic Theory and Computer Science Seminar (April 21, 2014); University of Rochester Economic Theory Seminar (March 5, 2013); Harvard/MIT Economic Theory Workshop (February 13, 2013); Yale University Microeconomic Theory Workshop (November 6, 2013); Microsoft Research New England Game Theory & Computation Seminar (October 30, 2013).

“Designing for Diversity in Matching”

14th ACM Conference on Electronic Commerce [EC’13] (June 20, 2013); University of Maryland IO/Theory Seminar (May 7, 2013); Second Cambridge Area Economics and Computation Day [CAEC’13] (April 26, 2013); Washington University in St. Louis Economic Theory Workshop (April 16, 2013); NYU Microeconomic Theory Workshop (March 27, 2013); University of Michigan Economic Theory Seminar (March 15, 2013); “Whither Affirmative Action?” session, AEA Meetings (January 5, 2013); Microsoft Research New England Research Seminar (December 18, 2012); University of Chicago Recruitment Seminar (November 15, 2012); University of Illinois at Urbana-Champaign Microeconomics Seminar (November 7, 2012); Boston College Microeconomics Seminar (October 31, 2012); NBER Market Design Working Group Meeting (October 20, 2012); Federal Reserve Bank of Chicago Economics Research Seminar (August 14, 2012); Fourth World Congress of the Game Theory Society [GAMES2012] (July 24, 2012); Econometric Society North American Summer Meetings (June 30, 2012); University of Haifa Economics Workshop (June 18, 2012); St. Andrews School of Economics & Finance Candlemas Seminar (April 26, 2012); University of Chicago Workshop in Economic Theory (April 10, 2012); Measuring and Interpreting Inequality Working Group Inaugural Meeting (February 18, 2012).

“A Theory of Empty Voting and Hidden Ownership”

Harvard Law, Economics, and Organizations Workshop (November 26, 2012); University of Chicago Workshop in Applications of Economics (May 21, 2012).

“Multilateral Matching”

“Price Theory and Market Design” session, AEA Meetings (January 7, 2012); Columbia Microeconomic Theory Colloquium (October 31, 2011); NBER Market Design Working Group Meeting (October 28, 2011); Maastricht Workshop on Recent Developments in Market Design (September 14, 2011); 12th ACM Conference on Electronic Commerce [EC’11] (June 9, 2011); Harvard SEAS Economics and Computer Science Research Seminar (April 14, 2011); MIT Economic Theory Research Workshop (March 1, 2011); Harvard Workshop on Research in Behavior in Games and Markets (December 1, 2010); Guest Lecture, Harvard Economics 2056a: Market Design (November 19, 2010).

“Concordance among Holdouts”

“New Challenges for Market Design” session, AEA Meetings (January 6, 2012); 12th ACM Conference on Electronic Commerce [EC’11] (June 8, 2011); Harvard Law, Economics, and Organizations Workshop (November 15, 2010); Yahoo! Key Scientific Challenges Summit (September 9, 2010); Economic Analysis Group, Antitrust Division, US Department of Justice (August 12, 2010); Harvard Business School Market Design Workshop (May 14, 2010); Harvard Workshop on Research in Behavior in Games and Markets (April 21, 2010); Harvard Graduate Student Political Economy Workshop (November 6, 2009); Harvard Law & Economics Seminar (November 5, 2009).

“Matching in Networks with Bilateral Contracts”

11th ACM Conference on Electronic Commerce [EC’10] (June 9, 2010); Northwestern EECS Economics Group Theory Seminar (April 5, 2010); Harvard Business School Negotiation, Organizations, & Markets Group Research Seminar (February 22, 2010); Stanford Market Design Workshop (January 8, 2010); Harvard SEAS Economics and Computer Science Research Seminar (November 19, 2009).

“Contract Design and Stability in Matching Markets”

“Pricing and Contracts” session, AEA Meetings (January 9, 2011); University of Chicago Informal Labor Economics Seminar (April 7, 2010); Guest Lecture, Harvard Economics 2056a: Market Design (November 20, 2009); Harvard Workshop on Research in Behavior in Games and Markets (November 18, 2009).

“Sticky Content and the Structure of the Web”

Workshop on Economics of Networks, Systems, and Computation [NetEcon] (July 7, 2009); Harvard SEAS Economics and Computer Science Research Seminar (April 30, 2009).

“Dynamic Position Auctions with Consumer Search”

5th Conference on Algorithmic Aspects in Information and Management [AAIM] (June 16, 2009); Harvard SEAS Economics and Computer Science Research Seminar (November 4, 2008).

“Clubs, Beliefs, and Entrapment”

AMS Session on “Behavioral Sciences,” Joint Mathematics Meetings (January 7, 2009).

“Configurations of Extremal Even Unimodular Lattices”

MathFest Student Paper Session (August 1, 2008); Brown Symposium for Undergraduates in the Mathematical Sciences (March 8, 2008); Harvard Undergraduate Research Symposium (November 11, 2006); Harvard College Program for Research in Science and Engineering [PRISE] (August 23, 2006).

“On Universality Properties of Positive-Definite Integral Quadratic Forms”

Harvard Math 99r: Tutorial on Binary Quadratic Forms (January 6, 2006); Intel International Science and Engineering Fair (May 12, 2005); Research Science Institute (July 29, 2004).

**Plenary Talks and Invited Addresses**

“Redistribution and Market Design,” Paul Kleindorfer Lecture, Conference on Economic Design (June 10, 2022).

“Fighting Inequality with Markets,” Public Lecture, University of Melbourne (July 25, 2019); Pathbreakers Session, Harvard Business School Reunions (June 7, 2019).

“Good Markets (Really Do) Make Good Neighbors,” First Workshop on Mechanism Design for Social Good [MD4SG] (June 26, 2017).

“Decisionmaking and Behavioral Economics: From Theory and Experiments to Policy,” Kavli Frontiers of Science U.S. Symposium (November 5, 2015).

“Measuring PRISE’s Success,” Harvard College Program for Research in Science and Engineering [PRISE] Anniversary Celebration (June 19, 2015).

“The Future of Economic Design,” University of Chicago Symposium on Technology and Society (May 2, 2015).

“Generalized Matching Market Design,” Fields Institute Conference on Optimization, Transportation and Equilibrium in Economics (September 15, 2014).

“Theory, Practice, and Engineering in (Generalized) Matching Market Design,” Harvard Center for Research on Computation and Society [CRCS] Lunch Seminar (November 20, 2013).

“*N* Things I Wish I Understood About (Differential) Privacy,” Simons Foundation Workshop on Applications of Differential Privacy to Economics and the Social Sciences (March 7, 2013).

“Crisp Printing and Small Type,” ScienceMONTGOMERY Award Ceremony (March 20, 2011).

“Frontiers of Matching Theory,” Vassar College Mathematics Colloquium (October 12, 2010).

“Configurations of Extremal Type II Lattices and Codes,” Morgan Prize Lecture, AMS-MAA-SIAM Special Session on “Research in Mathematics by Undergraduates,” Joint Mathematics Meetings (January 15, 2010).

#### **Expository Lectures (selected)**

“Theory, Practice, and Engineering in Market Design,” Distinguished Lecture, Harvard College Program for Research in Science and Engineering [PRISE] (July 7, 2020; July 10, 2018; June 27, 2017; June 28, 2016; July 22, 2014; July 11, 2013; July 5, 2012).

“Theory, Practice, and Engineering in Market Design,” Becker Friedman Institute Summer Research Experience for Undergraduates, University of Chicago (June 29, 2012).

“How Much Do You Bid?,” Guest Lecture, The Math Circle (May 3, 2009).

“Matchmaker, Matchmaker, Clear Out My House (an introduction to the theory of matching),” Harvard Mathematics Table (November 21, 2008).

“ $C = 15$  (new and old results of quadratic form representation theory),” Harvard Mathematics Table (October 20, 2007).

#### **Discussant Service**

“Fair Allocation of Vaccines, Ventilators and Antiviral Treatments: Leaving No Ethical Value Behind in Health Care Rationing” by Parag Pathak, Tayfun Sönmez, M. Utku Ünver, and M. Bumin Yenmez, Virtual Market Design Seminar (October 12, 2020).

“Platform Design when Sellers Use Pricing Algorithms” by Justin Johnson, Andrew Rhodes, and Matthijs Wildenbeest, “Pricing Algorithms, Competition, and Collusion” session, AEA Meetings (January 6, 2020).

“Information Cascades and Threshold Implementation” by Lin William Cong and Yizhou Xiao, “Applications of Auctions and Negotiations” session, AEA Meetings (January 6, 2019).

- “Litigating Innovation: Evidence from Securities Class Action Lawsuits” by Elisabeth Kempf and Oliver Spalt, “Corporate Governance: Creditor and Shareholder Monitoring” session, AEA Meetings (January 6, 2019).
- “Designing Advance Market Commitments for New Vaccines” by Michael Kremer, Jonathan Levin, and Christopher M. Snyder, Human Capital and Economic Opportunity [HCEO] Global Working Group “Development Economics & Market Design” conference (October 28, 2018).
- “Need vs. Merit: The Large Core of College Admissions Markets” by Avinatan Hassidim, Assaf Romm, and Ran I. Shorrer, “Large Matching Markets” session, AEA Meetings (January 6, 2018).
- “Game Abstractions for Counterfactual Prediction in Online Markets” by J. Mark Hou, Eric Sodomka, and Nicolas E. Stier-Moses, “Frontiers of Economic Theory and Computer Science” conference, Becker Friedman Institute (August 13, 2016).
- “Chinese College Admissions and School Choice Reforms: Theory and Experiments” by Yan Chen and Onur Kesten, “Market Design Experiments” session, AEA Meetings (January 3, 2014).
- “Localization and Colocalization within an Urban Area” by Stephen B. Billings and Erik B. Johnson, NBER Summer Institute Workshop on Urban Economics (July 22, 2013).
- “Dynamic Contracting: An Irrelevance Result” by Péter Esö and Balázs Szentes, Cowles Foundation Conference in Economic Theory (June 3, 2013).
- “Optimal Auction Design and Equilibrium Selection in Sponsored Search Auctions” by Benjamin Edelman and Michael Schwarz, “Designing Online Advertising Markets” session, AEA Meetings (January 5, 2010).

## ACADEMIC ACTIVITIES

### Leadership

- 2020 – present Scientific Council Member, Group for Research in APplied Economics [GRAPE], Poland
- 2019 – present Vice-Chair, Association for Computing Machinery [ACM] Special Interest Group on Economics and Computation [SIGecom]
- 2019 – present Advisory Board Member, Centre for Market Design, University of Melbourne
- 2018 – present National Leadership Council Member, Society for Science  
Governance Committee Chair (2021 – present)
- 2011 – present Co-Leader, Human Capital and Economic Opportunity [HCEO] “Inequality: Measurement, Interpretation, and Policy” Working Group [MIP]

### Organizational

- 2018 – present Co-Organizer, Program on “Mathematics and Computer Science of Market and Mechanism Design,” Mathematical Sciences Research Institute [MSRI]
- 2015 – present Co-Organizer, “Conference on Big Data,” Center of Mathematical Sciences and Applications, Harvard University

- 2011 – present Co-Organizer, American Economic Association Meetings sessions:
- 2020 “Matching under Inequality: Implications for Policy”
  - 2019 “Dysfunction in the Real Estate Market”
  - 2019 “New Advances in Matching with Contracts”
  - 2019 “Technological Progress and Inequality: Perspectives from Optimal Tax Theory”
  - 2018 “New Insights on Classic Questions in Matching Theory”
  - 2017 “Matching without Substitutes: Theory and Applications” (*Papers & Proceedings*)
  - 2017 “Market Design and Development Economics”
  - 2017 “Market Design: Theory and Practice”
  - 2016 “Predictive Cities” (*Papers & Proceedings*)
  - 2015 “Patent Economics”
  - 2014 “Frontiers of Market Design” (*Papers & Proceedings*)
  - 2013 “Whither Affirmative Action?”
  - 2012 “New Challenges for Market Design” (*Papers & Proceedings*)
  - 2012 “Price Theory and Market Design”
  - 2011 “Frontiers of Matching Theory”
- 2021 Senior Program Committee Member, “Conference on Web and Internet Economics [WINE]”
- Program Committee Member (2013)
- 2021 Program Committee Member, “3rd International Conference on Blockchain Economics, Security and Protocols [Tokenomics2021]”
- 2021 Program Committee Member, “ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization [EAAMO]”
- 2021 Program Committee Member, “Symposium on Foundations of Responsible Computing [FORC]”
- 2020 – 2021 Program Committee Member, “Conference on Mechanism and Institution Design [CMID]”
- 2020 Program Committee Member, “North American Winter Meeting of the Econometric Society”
- 2020 Program Committee Member, “Thirty-Fifth AAAI Conference on Artificial Intelligence”
- 2016 – 2019 Co-Organizer, “Social Science Applications Forum,” Center of Mathematical Sciences and Applications, Harvard University
- 2018 – 2019 Workshops Co-Chair, “ACM Conference on Economics and Computation [EC]”
- Senior Program Committee Member (2019 – 2020; 2017; 2014 – 2015); Program Committee Member (2021; 2012 – 2013)



- 2018 – 2019 Co-Chair, “Japanese-American-German Frontiers of Science [JAGFoS] Symposium,” Alexander von Humboldt Foundation, Japan Society for the Promotion of Science, and National Academy of Sciences  
Planning Group Member (2017)
- 2018 Co-Organizer, HCEO MIP Meeting on “Development Economics and Market Design”
- 2017 – 2018 Program Committee Member, “Workshop on the Economics of Networks, Systems and Computation [NetEcon]”
- 2017 Co-Chair, “Fourth International Workshop on Matching Under Preferences [MATCH-UP]”
- 2013 – 2017 Co-Organizer, Chicago Summer School on Socioeconomic Inequality
- 2016 Co-Organizer, “Predictive Cities” exploratory seminar, Radcliffe Institute for Advanced Study
- 2016 Co-Organizer, HCEO MIP Meeting on “Market Design Perspectives on Inequality”
- 2015 Co-Chair, “Conference on Auctions, Market Mechanisms and Their Applications [AMMA]”
- 2015 Program Committee Member, “Workshop on Social and Information Networks”
- 2015 Program Committee Member, “International World Wide Web Conference [WWW]”
- 2014 – 2015 Co-Organizer, “CRCS Seminar,” Center for Research on Computation and Society [CRCS], Harvard University
- 2014 Co-Organizer, “Midway Market Design Workshop [MDW MDW],” Becker Friedman Institute for Research in Economics, University of Chicago
- 2014 Co-Organizer, “25th Jerusalem School in Economic Theory: Matching and Market Design”
- 2014 Program Committee Member, “12th Meeting of Society for Social Choice and Welfare”
- 2014 Program Committee Member, “Symposium on Algorithmic Game Theory [SAGT]”
- 2014 Co-Organizer, “Taxation and Matching” workshop, Department of Economics, Sciences Po
- 2011 – 2012 Organizer, “Workshop in Economic Theory,” Department of Economics, University of Chicago, Fall
- 2012 Co-Organizer, HCEO MIP Meeting on “Intergenerational Mobility”
- 2012 Lead Organizer, HCEO MIP Inaugural Meeting
- 2012 Co-Organizer, “Matching Theory: Economics meets Mathematics” conference, Becker Friedman Institute for Research in Economics and Stevanovich Center for Financial Mathematics, University of Chicago
- 2011 Organizational Chair, “Matching and Price Theory” conference, Milton Friedman Institute for Research in Economics, University of Chicago

#### **University Committee Service**

- 2019 – present Executive Committee Member, University Committee on Registration and Course Allocation, Harvard University  
Member (2018 – 2019)
- 2019 – present Member, FAS–SEAS Committee on Applied Mathematics, Harvard University

- 2017 – present Member, University Subcommittee on the Degree of Doctor of Philosophy in Business Economics, Harvard University
- 2017 – present Member, Departmental Committee on the Undergraduate Concentration in Applied Mathematics – Economics Track, Department of Economics, Harvard University

### Editorial Service

- 2022 – present Board of Editors Member, *Journal of Economic Literature*
- 2021 – present Associate Editor, *Journal of Economic Theory*
- 2021 – present Associate Editor, *ACM Transactions on Economics and Computation*
- 2018 – present Associate Editor, *Management Science*
- 2018 – present Associate Editor, *Journal of Mechanism and Institution Design*
- 2021 – 2022 Guest Co-Editor, Issue on the Economics of Vaccines and Pandemic Response, *Oxford Review of Economic Policy*
- 2018 – 2019 Guest Co-Editor, Issue on EC'17, *ACM Transactions on Economics and Computation*
- 2017 Guest Co-Editor, Issue on Market Design, *Oxford Review of Economic Policy*

### Other Professional Service

- 2021 – present Selection Committee Member, Nakahara Prize, Japanese Economic Association
- 2019 – present Selection Committee Member, Jon C. Graff Prize for Excellence in Science Communication, Society for Science
- 2019 – present Senior Common Room Member, Lowell House, Harvard University
- 2013 – present Mathematics Grand Awards Co-Chair, International Science and Engineering Fair [ISEF], Society for Science
- 2013 – 2017 Selection Committee Member, Joseph Lieberman Award for Significant Contribution to Science and Technology, Center for Excellence in Education
- 2011 Head Tutor, Program for Research in Markets and Organizations [PRIMO], Harvard Business School
- 2009 – 2011 Non-Resident Tutor, Kirkland House, Harvard University
- 2005 – 2011 Paper Reviewer, Research Science Institute, MIT
- 2008 Program Assistant, Program for Research in Science and Engineering [PRISE], Harvard College

## ACADEMIC ADVISING

### Graduate

Name	Year	Institution	Field(s)	Initial Placement
Hanzhe Zhang	2015	Chicago	Applied Theory, Market Design	Michigan State University

Jörn Boehnke	2015	Chicago	Industrial Organization	Harvard CMSA (postdoc)
Kentaro Tomoeda	2016	Harvard	Theory, Market Design	University of Technology Sydney
Benjamin Roth	2017	MIT	Development, Market Design	Harvard Business School, EM Unit
Ging Cee Ng	2018	Chicago	Applied Micro, Public Finance	Analysis Group
Neil Thakral <sup>M</sup>	2018	Harvard	Applied Micro, Behavioral	Brown University
Carmen Wang	2018	Harvard	Market Design, Experimental	Uber
Abraham Holland	2019	Harvard	Development, Market Design	Institute for Defense Analyses
Yosub Jung	2019	Harvard	Finance, Entrepreneurship	Analysis Group
Hongyao Ma <sup>SIGecom</sup>	2019	Harvard	Market Design	Columbia Business School
Ravi Jagadeesan <sup>M</sup>	2020	Harvard	Market Design, Theory, Macro	Stanford (postdoc)
Zhe Feng	2021	Harvard	Market Design	Google Research

<sup>M</sup> = awarded the Martin Award for Excellence in Doctoral Research in Business Economics  
<sup>SIGecom</sup> = awarded the ACM SIGecom Doctoral Dissertation Award

### Undergraduate

Name	Degree	Year	Graduate Institution (if any)
Janet Lu <sup>NSF,PBK</sup>	AB, <i>summa</i>	2014	Columbia (PhD)
Zoë Hitzig <sup>H</sup>	AB, <i>magna</i>	2016	Cambridge (MPhil); Harvard (PhD)
David Freed <sup>H,Ha,PBK</sup>	AB, <i>magna</i> with highest honors; SM	2016	
Evan Zimmerman	BA + honors	2016	Berkeley (Law)
Nathaniel Ver Steeg <sup>H,PBK</sup>	AB, <i>summa</i>	2017	Cambridge (MPhil)
Ravi Jagadeesan <sup>W,H,Mo,NSF,PBK</sup>	AB, <i>summa</i> ; AM	2018	Harvard (PhD)
Jiafeng Chen <sup>H,PBK</sup>	AB, <i>summa</i> ; AM	2019	Harvard (PhD)

Shira Li <sup>H</sup>	AB, <i>magna</i> with highest honors	2019	Harvard (PhD)
Hannah Ellery <sup>H</sup>	AB, <i>magna</i> with highest honors	2021	Harvard (PhD)

<sup>W</sup> = awarded the Jacob Wendell Scholarship Prize

<sup>H</sup> = awarded the Thomas Temple Hoopes Prize

<sup>Ha</sup> = awarded the Seymour E. and Ruth B. Harris Prize

<sup>NSF</sup> = awarded an NSF Graduate Research Fellowship

<sup>Mo</sup> = awarded the AMS-MAA-SIAM Frank and Brennie Morgan Prize

<sup>PBK</sup> = Phi Beta Kappa

### Economic Design Fellows

Name	Home Institution	Year	Field(s)	Next Port of Call
Max Cytrynbaum	Chicago	2015	Market Design	MIT (PhD)
Nick Jaeger	Woodside Priory	2015	Applied Micro	Harvard (AB)
Ravi Jagadeesan <sup>W,H,Mo,PBK</sup>	Harvard	2016 – 2018	Theory, Math, Market Design	Harvard (PhD)
Robbie Minton	Chicago	2016	Price Theory, Applied Micro	Harvard (PhD)
Ross Rheingans-Yoo	Harvard	2016	Theory, Math, Market Design	Jane Street
Joseph Shayani <sup>PBK</sup>	Stanford	2016	Theory, Computer Science, Market Design	MIT (PhD)
Daniel Chavez	Chicago	2017	Theory, Applied Micro	Analysis Group
Jiafeng Chen <sup>PRISE,PBK</sup>	Harvard	2017	Market Design, Theory, Applied Micro	Harvard (PhD)
George Hou <sup>PRIMO</sup>	Harvard	2017	Applied Micro	Silver Lake
Alan Lam	Harvard	2017	Entrepreneurship	PJT
Shira Li <sup>PRIMO</sup>	Harvard	2017	Theory, Math, Market Design, Computer Science	Goldman
Duncan Rheingans-Yoo <sup>PRISE</sup>	Harvard	2017	Computer Science, Market Design	Jane Street
Winston Shum	Lawrenceville	2017	Entrepreneurship, Sustainability	Stanford (BA)

Charlie Ughetta	Princeton	2017	Entrepreneurship, Finance	Jeffries
Franklyn Wang <sup>RSI</sup>	Thomas Jefferson	2017 – 2018	Theory, Math, Market Design, Computer Science	Harvard (AB)
Claire Shi <sup>PRIMO,PBK</sup>	Harvard	2018	Behavioral, Market Design	Harvard (PhD)
Michael Zarian <sup>PRIMO</sup>	Harvard	2018	Entrepreneurship	
Gerald Xu	Deerfield	2018	Theory, Math, Market Design	Harvard (AB)
Matthew Shum	Lakeside School	2018	Theory, Math, Market Design	Harvard (AB)
Aditya Dhar <sup>PRIMO,PRISE</sup>	Harvard	2019	Theory, Econometrics	US CEA
Jimmy Lin <sup>PRIMO</sup>	Harvard	2019	Theory, Computer Science	Quantco
Mirac Suzgun	Harvard	2019	Computer Science, Applied Macro	Stanford (PhD)
Douglas Yang	Andover	2019	Math	Harvard (AB)
Siye Zhu <sup>PRISE</sup>	Harvard	2019	Theory, Applied Micro	Two Sigma
Yunseo Choi <sup>RSI</sup>	Exeter	2020	Theory, Math	Harvard (AB)
Louis Golowich <sup>PRIMO</sup>	Harvard	2020	Theory, CS	Berkeley (PhD)
Andrew Garber <sup>PRIMO</sup>	Harvard	2021	Theory, Math, Market Design	
Suat Evren <sup>PRIMO</sup>	MIT	2022	Theory, CS, Market Design	

<sup>W</sup> = awarded the Jacob Wendell Scholarship Prize

<sup>H</sup> = awarded the Thomas Temple Hoopes Prize

<sup>PRISE</sup> = Program for Research in Science and Engineering Fellow

<sup>PRIMO</sup> = Program for Research in Markets and Organizations Fellow

<sup>RSI</sup> = Research Science Institute Summer Scholar

<sup>Mo</sup> = awarded the AMS-MAA-SIAM Frank and Brennie Morgan Prize

<sup>PBK</sup> = Phi Beta Kappa

## ENTREPRENEURIAL ADVISING (SELECTED)

2021 – present Advisory Board Member, Thingdoms, Scotland, UK



2021 – present Advisory Board Member, Hungry Wolves NFT, Austin, TX  
 2021 – present Advisory Board Member, FINE Digital  
 2021 – present Advisory Board Member, koodos, New York, NY  
 2021 – present Advisory Board Member, OneChronos, New York, NY  
 2020 – present Exchange Design Technical Advisory Panel Member, COVAX, Geneva, Switzerland  
 2019 – present Advisory Board Member, Lunchclub, San Francisco, CA  
 2018 – present Economic Advisor, Novi Financial, Inc., Menlo Park, CA

## REFEREEING

**Economics:** *American Economic Journal: Economic Policy, American Economic Journal:*

*Microeconomics, American Economic Review, Cambridge University Press, Econometrica, Economic Journal, Economic Theory, Economics and Business Letters, Economics Letters, European Journal of Operational Research, European Research Council [ERC], Games and Economic Behavior, International Journal of Game Theory, International Journal of Industrial Organization, Journal of Economic Behavior and Organization, Journal of Economic Geography, Journal of Economic Literature, Journal of Economic Theory, Journal of Finance, Journal of Health Economics, Journal of Law and Economics, Journal of Law, Economics and Organization, Journal of Legal Studies, Journal of Mathematical Economics, Journal of Political Economy, Journal of the European Economic Association, Journal of Urban Economics, Management Science, Mathematical Social Sciences, Mathematics of Operations Research, National Science Foundation [NSF], Operations Research, Papers in Regional Science, Proceedings of the National Academy of Sciences, Public Choice, Quarterly Journal of Economics, RAND Journal of Economics, Review of Economic Studies, Southern Economic Journal, Swiss National Science Foundation [SNSF], Theoretical Economics, U.S.-Israel Binational Science Foundation, Yale University Press*

**Computer Science:** *AAAI Conference on Artificial Intelligence [AAAI], ACM Conference on Economics and Computation [EC], ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization [EAMMO], Algorithms, Artificial Intelligence, Conference on Web and Internet Economics [WINE], Innovations in Theoretical Computer Science Conference [ITCS], International Workshop on Computational Social Choice [COMSOC], International World Wide Web Conference [WWW], Symposium on Discrete Algorithms [SODA], Symposium on Foundations of Computer Science [FOCS], Symposium on Foundations of Responsible Computing [FORC], Workshop on Auctions, Market Mechanisms and Their Applications [AMMA], Workshop on the Economics of Networks, Systems, and Computation [NetEcon], Workshop on Social and Information Networks*

**Mathematics:** *American Invitational Math Exam [AIME], American Mathematics Competition [AMC], Applicable Analysis and Discrete Mathematics, Current Science, Discrete Applied Mathematics, Journal of Integer Sequences, Journal of Number Theory, Journal of Theoretical Biology*

**Sociology:** *American Sociological Review*

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#### Social Media

Social Media of X-Consoles

Twitter: <https://twitter.com/0xConsoles>

Discord

Website: <https://www.xconsoles.tv/>

Social Media of Refik Anadol

Website: <https://refikanadolstudio.com/>

Wikipedia: [https://en.wikipedia.org/wiki/Refik\\_Anadol](https://en.wikipedia.org/wiki/Refik_Anadol)

Instagram: <https://www.instagram.com/refikanadol/?hl=en>

Twitter: <https://twitter.com/refikanadol>

Discord

Social Media for Thankyoux

Website: <https://thankyoux.com/>

Instagram: <https://www.instagram.com/thankyoux/>

Twitter: <https://twitter.com/ThankYouX>

Social Media for mpkoz

Website: <https://www.mpkoz.com/>

Instagram: <https://www.instagram.com/mpkoz/>

Twitter: <https://twitter.com/mpkoz>

Social Media of the Exponentials Art Project

Website: <https://exponentials.art/>

Discord

Twitter: <https://twitter.com/exponentialsnft>

Social Media of RTFKT and affiliated pages

Website: <https://rtfkt.com/>

Twitter: <https://twitter.com/RTFKT>

Discord

Opensea: <https://opensea.io/collection/mintdiscthree>

Opensea: <https://opensea.io/collection/mintdiscone>

Social Media for MetaBirkins

Twitter: <https://twitter.com/metabirkins>

Website: <https://metabirkins.com/>

Instagram: <https://www.instagram.com/metabirkins/>

Discord (What was publicly available)

TikTok: <https://www.tiktok.com/@metabirkin>

TikTok: Videos that appeared for various search terms in the vicinity of "MetaBirkin"

Social Media for Bored Ape Yacht Club

Twitter: <https://twitter.com/BoredApeYC>

Website: <https://boredapeyachtclub.com/#>

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Discord

Social Media for the Chain Runners

Discord

Social Media for the Paradise Trippies

Discord

Social Media for SupDucks

Twitter: <https://twitter.com/RealSupDucks>



Social Media for Doodles

Twitter: <https://twitter.com/doodles>

Discord

Social Media for Noodles

Twitter: [https://twitter.com/noodles\\_nft](https://twitter.com/noodles_nft)

Discord

Social Media for SOLIDS NFT

OpenSea: <https://opensea.io/collection/solids-by-far>

Social Media for Curio Card:

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Social Media for Goblin Town

Website: [goblintown.wtf](http://goblintown.wtf)

Social Media for The Hundreds

Website: [thehundreds.com](http://thehundreds.com)

Social Media for Mason Rothschild

Twitter: <https://twitter.com/MasonRothschild>

Instagram: <https://www.instagram.com/masonrothschild/>

Social Media for ILYYW

Twitter: <https://twitter.com/ILYYWNFT>

Discord

Instagram: <https://www.instagram.com/ilikeyouyoureweird/>

Social Media for NeoTokyo

Twitter: <https://twitter.com/NeoTokyoCode>

Discord

Website: <https://neotokyo.codes/>

Social Media for Mobland

Twitter: <https://twitter.com/MoblandHQ>

Website: [Mob.land](https://mob.land)

Discord

Social Media for Swampverse

Website: [swamps.io](https://swamps.io)

Social Media for Soulware

Website: <https://www.soulwareproject.com/>

Twitter: <https://twitter.com/soulwarenft>

Discord

Social Media for Alex Becker

Youtube: <https://www.youtube.com/channel/UCKQvGU-qtjEthINeViNbn6A>

Twitter: <https://twitter.com/ZssBecker>

Social Media for Mister V

Instagram: <https://www.instagram.com/yvick/>

Social Media for Elliotrades

Twitter: <https://twitter.com/elliотrades>

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Social Media for Macy's

Discord

Website: <https://www.macys.com/>

Social Media for Nike

Discord

OpenSea: <https://opensea.io/collection/rtfkt-nike-cryptokicks>

Social Media for Adidas

OpenSea: <https://opensea.io/collection/adidasoriginals>

Social Media for Gucci

Discord

Opensea: <https://opensea.io/collection/10ktf-gucci-grail>

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Social Media for Moonbirds

Website: <https://www.moonbirds.xyz/>